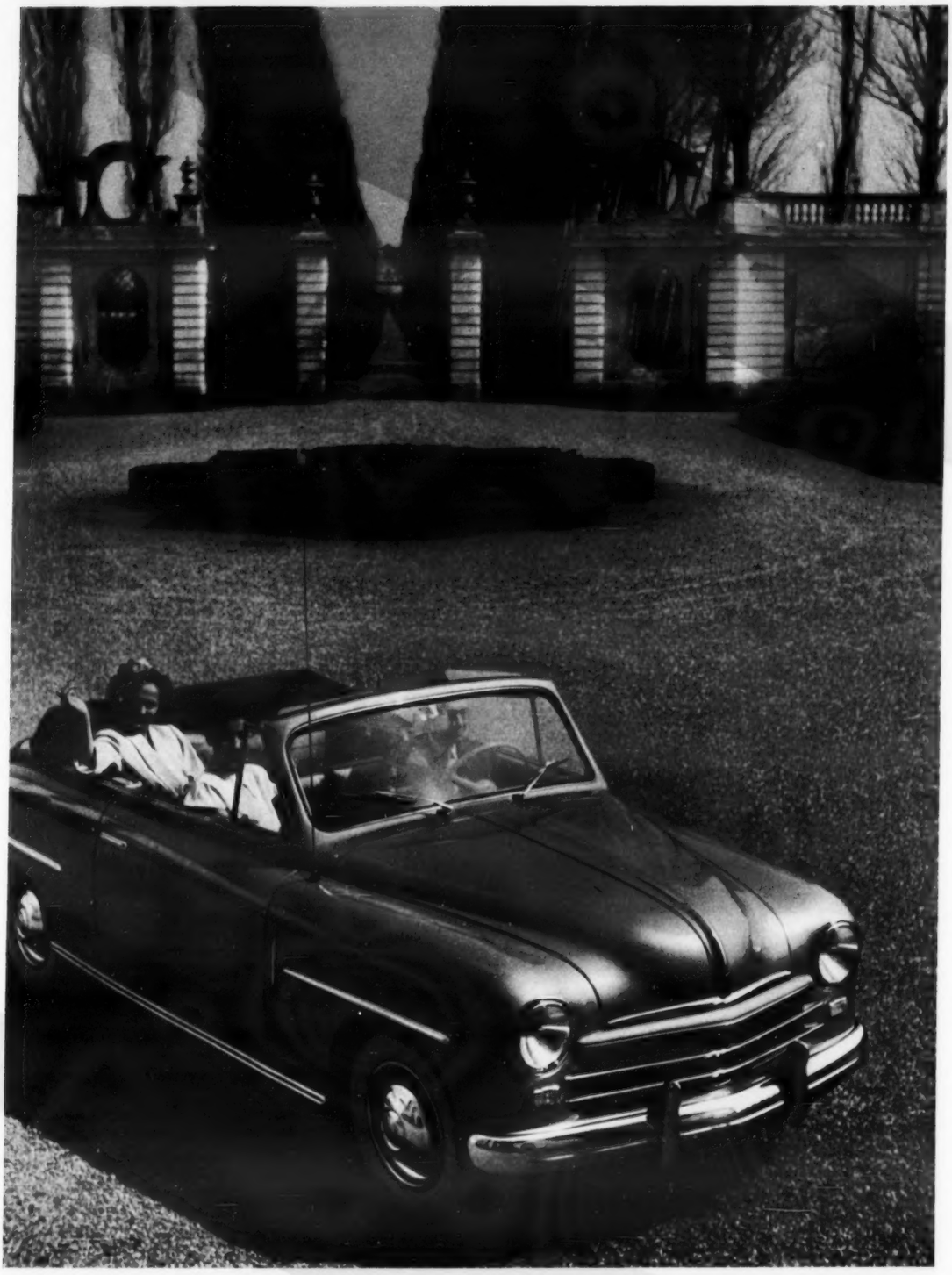
INTERAVIA

REVIEW OF WORLD AVIATION

IN THIS ISSUE:

Four Days in Paradise

VOLUME V 4 1950



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INTERAVIA

Review of World Aviation

Volume V 1950 No 4

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Front cover :

Fishermen preparing to sail from an island in the South Pacific.

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"What's good is profitable...",

says the businessman.

In these busy times I appreciate the relaxation I get from flying KLM. With the same quiet efficiency as they put your hat and coat away, they see to your comfort until they are sure you're a fitter man on arrival! I'm certainly sold on this perfect service. Indeed ... *"Flying comes natural to the Dutch!"*

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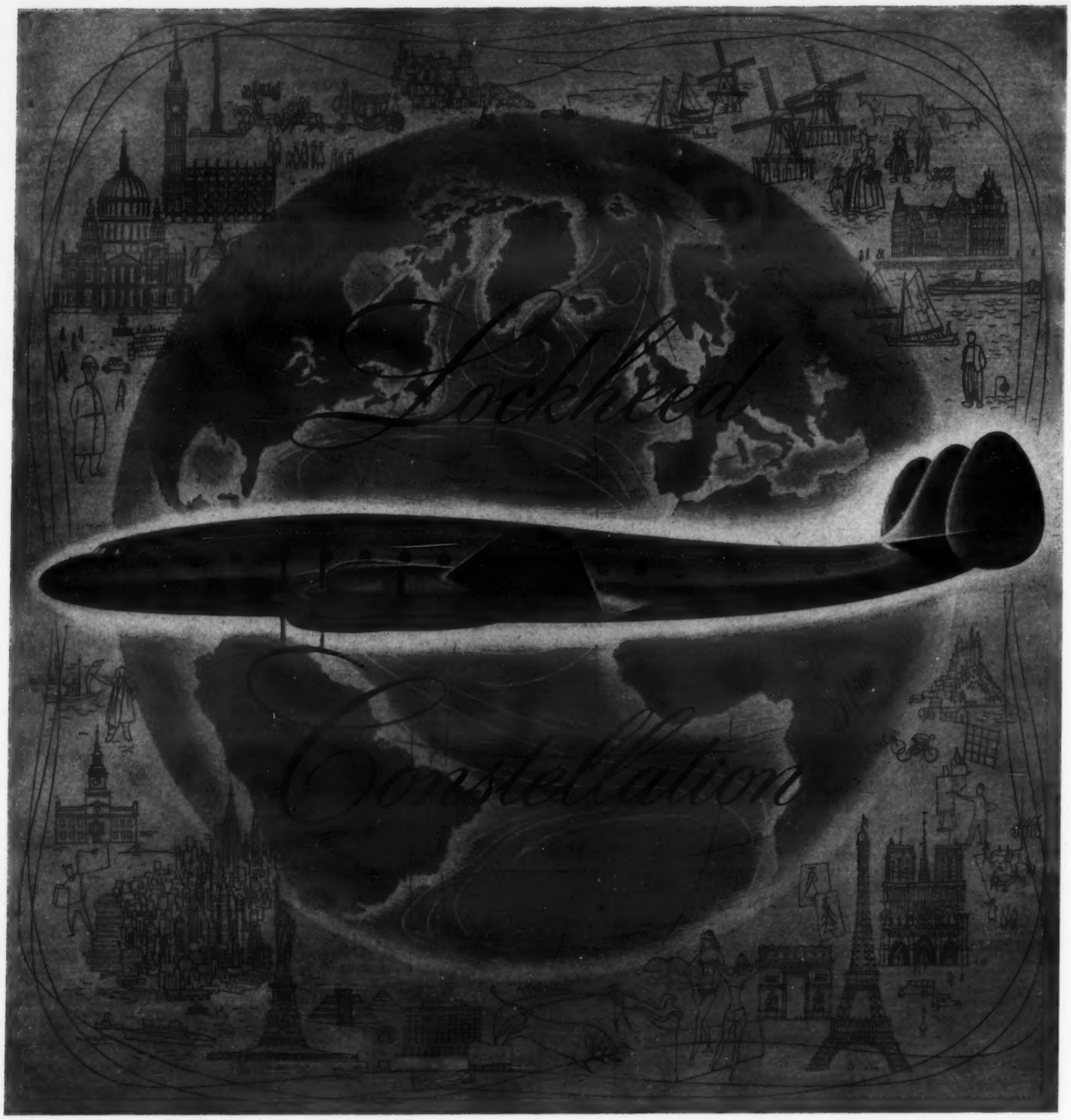

Queen of the Atlantic

The preferred airplane for trans-Atlantic travel continues to be the Lockheed Constellation, which offers speed and comfort, and *tried and proven dependability.*
Queen of the Atlantic, and pride of 15 leading world airlines, the majestic Constellation has flown more than 5,000 million passenger miles and 20,000 Atlantic crossings.
Significantly, the Constellation is the most *reordered* four-engined transport in the world today.

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Burbank, California

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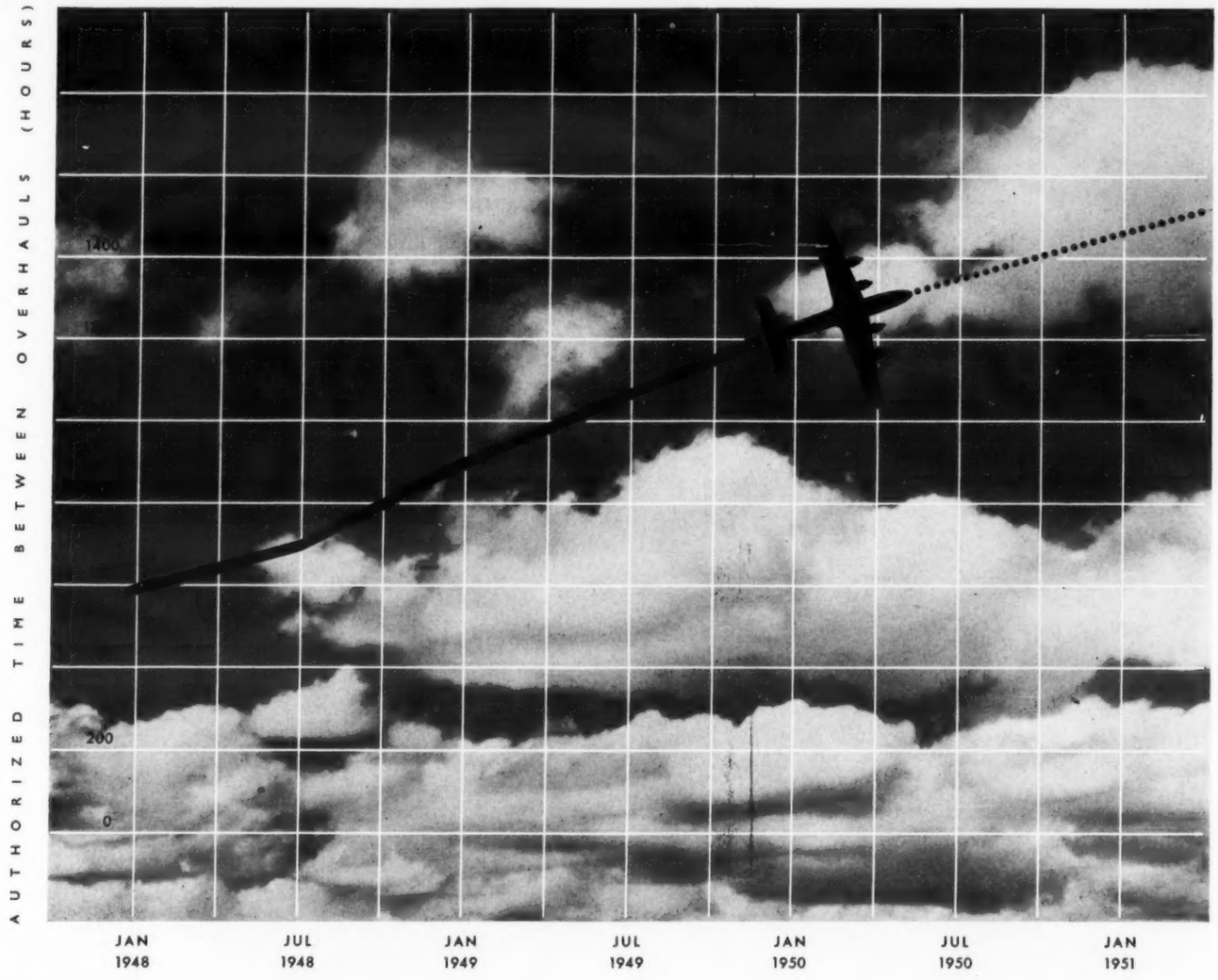


More flight hours... more profitable airline operation... are end results of this sharp upward trend in the authorized time between overhauls of Cyclone engines.

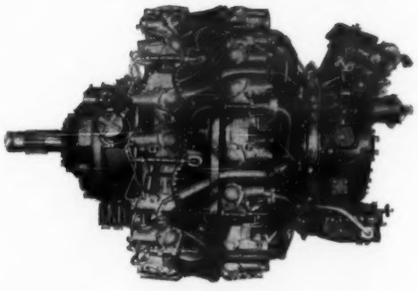
Wright Cyclone 18BD on the Lockheed Constellation saves hundreds of overhaul and spark-plug-change hours.

▶ NEWS OF THE MONTH is the endurance record of the Wright Cyclone 18BD on the Lockheed Constellation... despite the short time it has been in production for airline service.

In the brief span of two years, this 2500 horsepower aircraft engine has extended authorized time between overhauls from 600 hours to 1200 hours in fleet operation.

▶ In addition to this outstanding performance record, a nearly 70% improvement—from 300 to 500 hours—has been effected in the authorized spark plug change time.

▶ Such records reflect the sound engineering design and built-in durability typical of Wright Cyclone engines... characteristics that have produced these gains in authorized overhaul time... corresponding reductions in overhaul costs... and customer-satisfying schedule reliability.



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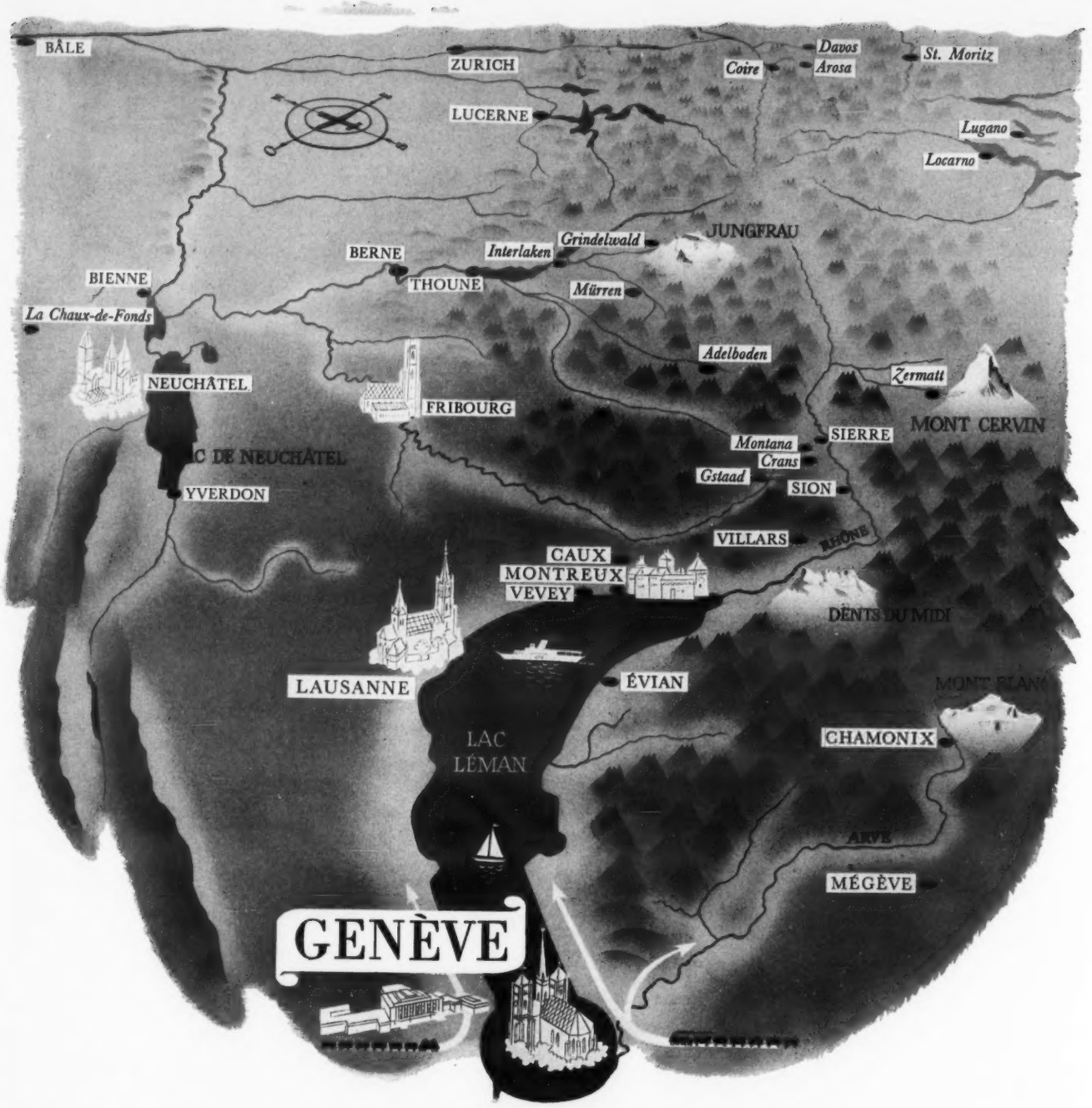
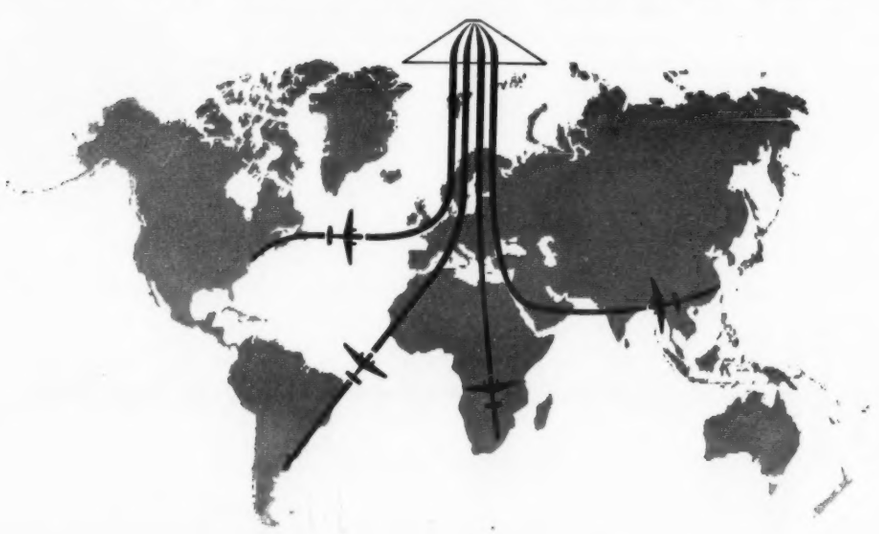


Geneva, International Aviation Centre



THOUSANDS OF ENGINEERS TRAVEL BY AIR FRANCE

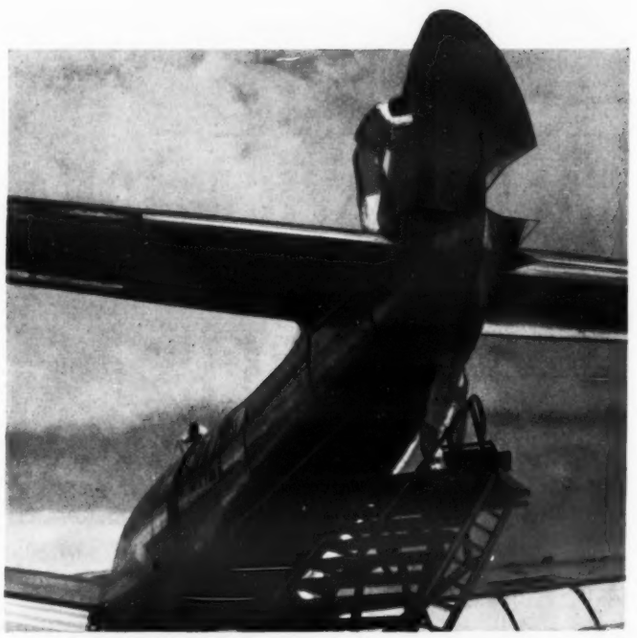
Why?

They know that the skippers of Air France's modern transport aircraft are specialists in long-range operations and that most of them have flown several million miles. They are familiar with the equipment Air France uses on its 125,000-mile network of routes : powerful four-engined Douglas DC-4, "Languedoc" and "Constellation" airliners which have proved their worth on the air lanes of the world. Air France's equipment is constantly being renewed and modernized. It is maintained, serviced and overhauled at regular intervals in Air France's own workshops, the most modern of their kind in Europe.

It stands to reason that you, as an air-minded person, should do like these thousands of engineering specialists and fly . . . by Air France.

Travel by Air France . . . and you will discover for yourself why 750,000 passengers took this same advice in 1949 alone.

Like them you will appreciate the service provided by Air France, the airline system on which you travel "*à la française*".



P172

AIR FRANCE

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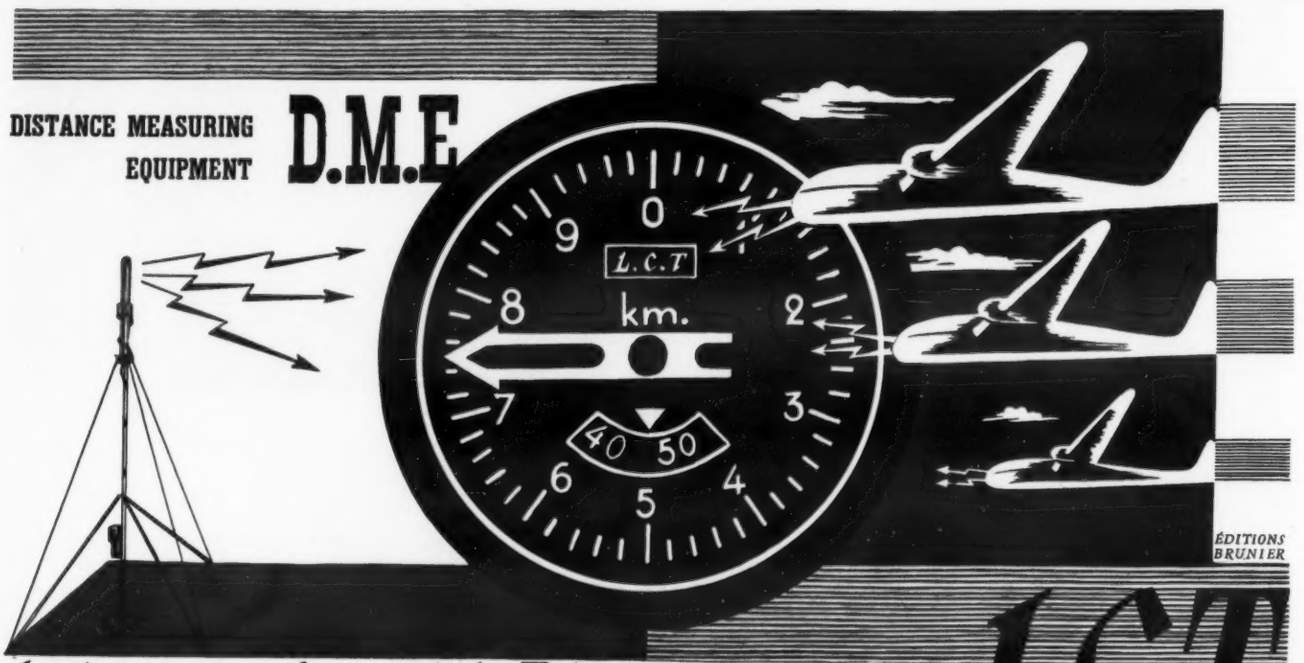

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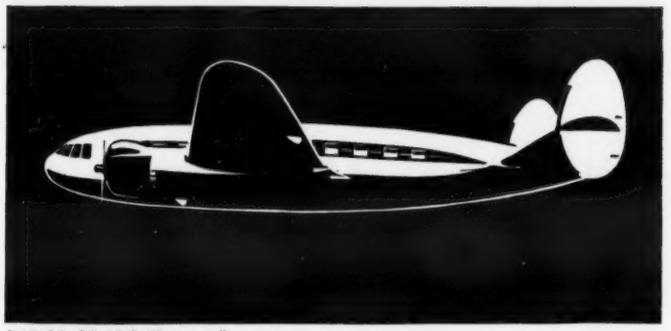
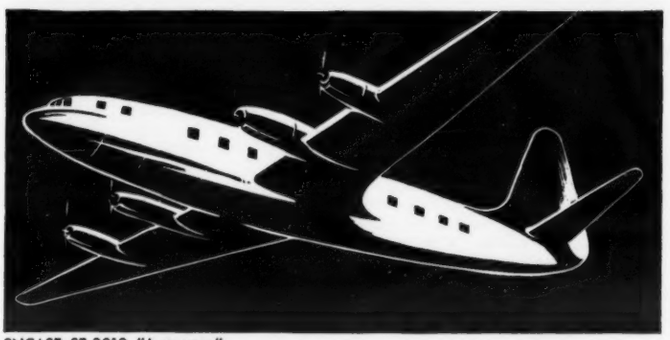
3 NEW FRENCH AIRLINERS

Air progress has taken three steps forward in France with the production of two long-range type transports and one medium-range type transport. Each brings new and advanced features in air transport.

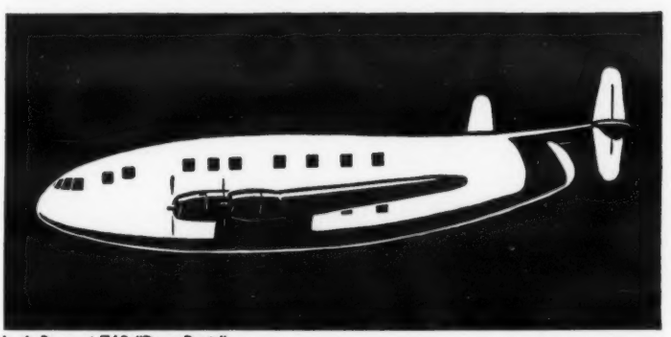
And like so many other airliners serving countries in all parts of the world, each of these new transports is powered by dependable Pratt & Whitney engines turning Hamilton Standard propellers.



SNCASO SO-30-P, "Bretagne"



SNCASE SE-2010, "Armagnac"



Louis Breguet 763 "Deux-Ponts"

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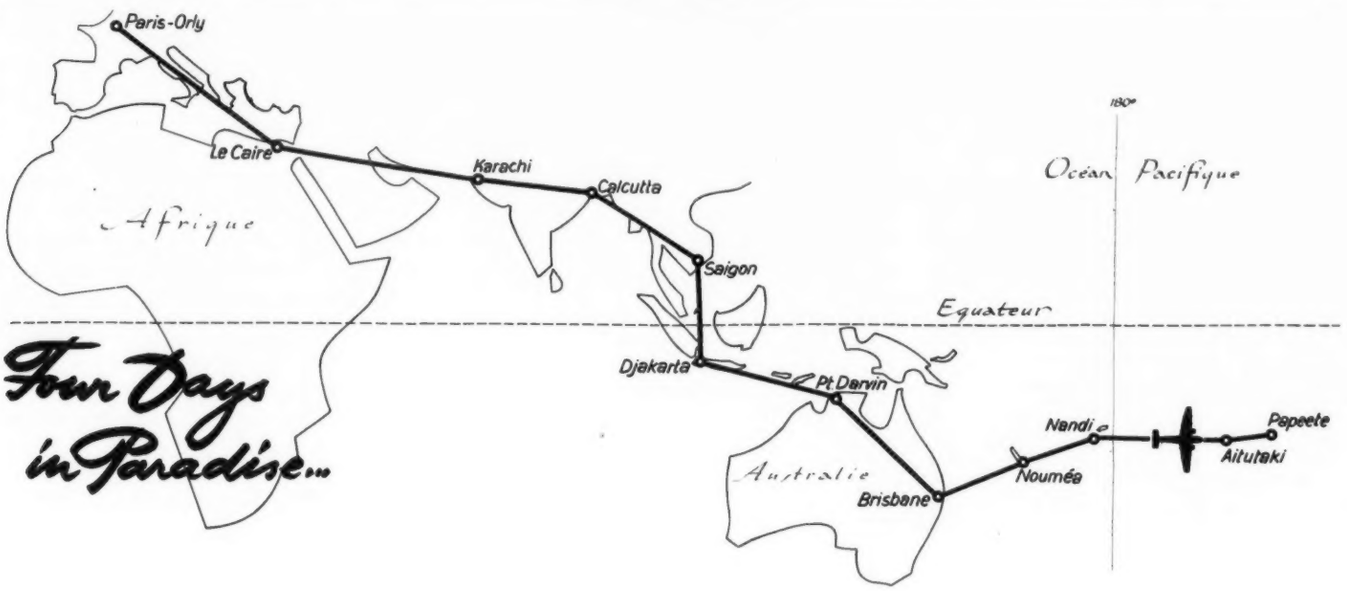
The New

"FIAT G.59"

High-Speed Trainer

The G. 59 is a modern fighter-trainer, developed as a single-seater and as a two-seater. It is designed to fulfill missions requiring speed and manœuvrability combined with high rates of climb. Its easy handling characteristics make it the ideal type for basic and advanced training. It is particularly suitable for the training of pilots at top speeds, at great altitudes and in acrobatic flying.

Its unusual robustness allows a pilot—from the point of view of structural strength—to perform even the most hazardous manœuvres with the greatest degree of safety. It is fitted with the latest instruments and equipment and reaches a maximum speed of 370 miles per hour (600 km/h) in level flight.



31,000 Miles in 145 Hours' Flying Time on the World's Longest Air Route

A few months from now Air France will inaugurate the last leg of its Paris—Saigon—Noumea—Tahiti trunk route, a mere trifle of 15,519 miles. At the present time regular schedules are flown as far as Noumea, in New Caledonia.

A few weeks ago Air France made a proving flight to determine the extent of the work necessary to make the ground facilities, particularly in the New Hebrides, the Cook Islands and the Leeward Islands, suitable for regular transport operations. Personalities who took part in the flight included Admiral Nomy, Inspector-General of French naval aviation: Monsieur Hebrard, Air France's Far East Regional Manager, and Georges Février, Interavia's *representative in France. In a flying time of 145 hours the party covered about 31,000 miles. The whole trip took 18 days, of which 8 days were used for intermediary landings: one day in Saigon, Indo-China; three days in Noumea, New Caledonia; and four at the terminal point, the island of Tahiti, in the South Pacific. An average of more than 12 hours was spent in the air on each travelling day.*

Personal Declaration of Origin and Health, in French and in English.

"Indicate where you have spent the 14 nights immediately preceding your arrival in this country." Here goes:

Last night:	In flight (F-BAZP)
Night before last:	Saigon
Three nights ago:	Port Darwin
Four nights ago:	Noumea
Five nights ago:	In flight (F-BELH)
Six nights ago:	Bora-Bora
Seven nights ago:	Papeete

Of the countless documents and forms I had to fill in like any other air traveller, this "Personal Declaration of Origin and Health" is about the only one which offered me a certain amount of interest...

Seven days ago I was at Tahiti, at the other end of the world, and even a little farther. Here I am back home, rattling away at my typewriter.

Good old Jules Verne, who fired the imagination of youngsters "less than 40 years of age," could not have foreseen this development. What are "Five Weeks in a Balloon" or "40,000 Leagues under the Sea" in comparison with this voyage over the longest air route of the world, a voyage of 31,000 miles in 145 hours of flight, a voyage which tomorrow will be as commonplace as a trip from London to the Cape or from New York to San Francisco?

Yesteryear, before the war, the Orient-Express carried you to the other end of Europe in five days. Today the aeroplane needs the same amount of time to take you from one end of the world to the other.

We have made progress in the past ten years.

The "Transatlantic Climate"

These very long trips by air, of the kind I have just completed, are nevertheless a little different from the usual ocean crossings or inter-city flights. When you fly from Europe to the United States you do hardly more than exchange a few words with the passenger in the seat next to yours, but when the same people travel together for a week it is inevitable that acquaintances and friendships spring

The Annamese stewards at work.

up. After each stop the passengers go back to "their" aircraft, where they have left their luggage, their armchairs, their seat pockets with their little personal belongings. They share the same life, admire the same sights at the same moment, and eat the same meals at the same fixed hours. They share their impressions, tell each other how they spent their stop-overs, and during the long monotonous hours of flight over sand and water they chat or play bridge.

The result is that the "travelling companions"—the term acquires its real sense—no longer are prisoners of their armchairs, as is the case on the run-of-the-mill air trips. They move, change seats, go forward to fish something out of their suitcases or aft to order drinks of friendship from the steward whom, of course, they call by his first name.

The aircraft thus creates a genuine community with mutual and simultaneous reactions to such things as temperature, the beauty of the scenery, or the inevitable vexations arising out of each landing. A community which is prepared to receive with enthusiasm the great attraction of the trip : the christening of the neophytes crossing the Equator, an event which is just as good as that organized on a passenger steamship. Although the swimming pool for the final immersion of the catechumen is lacking, Neptune and Amphitrite, with their fluid weapons, their trident, and their telescope, are as severe (?) aboard a Douglas DC-4 as on the bridge of a transatlantic liner. And they are greeted with the same bursts of laughter.

Neptune proceeds to douse passengers upon crossing the Equator.

Too Fast... Or Not Fast Enough

Begun in a "Constellation" (from Paris to Saigon) and continued in a Douglas DC-4 (from Saigon to Bora-Bora), the outward bound voyage was completed on its last leg of a few hundred miles in a "Catalina" amphibian, for the very good reason that Tahiti does not possess a landing field.

Aerial voyages have ceased to be adventures, even over very long distances. My own trip was completed by "Constellation." The passengers on the early Far East services still had an opportunity of admiring the Sphinx and the Pyramids, of walking about in Calcutta and flying over the temple of Angkor. They became acquainted with all sorts of little townships—Jask, Bender, Abbas, Allahabad, etc.—which aviation had "put on the map" and removed from their local anonymity.

The shadow of a DC-4 passes for the first time over the palm groves of Tahiti.

Just as the appearance of tomorrow's new types of aircraft, with their greater range, will erase the names of certain present stop-over points.

For the "Constellation," this modern express airliner uniting Paris and Saigon in 32 hours (which is quite remarkable), is only an intermediary stage : it is not yet fast enough. Tomorrow people will want to fly in a single hop from Paris to Indo-China and cover the 7,500 miles in one day.

The stops at Cairo, Karachi and Calcutta—separated by stages of between 1,400 and 2,250 miles—already today seem useless and irksome. The meals which await you at these places—very inferior to those which Air France serves aboard—are a poor compensation for the endless red tape which accompanies each return to the ground. If refuelling in flight had as its one advantage the elimination of the innumerable questionnaires, inspections and enquiries which were invented by the health services, the customs and the police of all the countries of the world to charm the air traveller, this elimination would be sufficient reason for adopting the aerial tanker for air transport use.

"Facilitation"... so-called

ICAO has a special Facilitation Committee. Several weeks ago this committee published a bulletin congratulating itself on the results it has obtained. It is too bad that some of the committee members who wrote the communiqué were not able to come along on our trip. They would have discovered, first, that even as passengers "in transit" they would have had to obtain visas for Australia (one to go and one to return), Indonesia, India (also for both directions) and the Fiji Islands (both directions). They would have had to display certificates of vaccination against smallpox and cholera and to obtain authorizations to export currency... not to mention passports.

All this represents, at best, three or four days of calls, of filling in endless questionnaires, of handing over photos... and of paying large fees to the various consulates.

But this is only a start, for at each stop you have to begin all over again. And this often in order to remain one hour on the ground, without even leaving the airport.

It is very true that the vexations of flying begin on the ground.

Everywhere, or nearly, you are asked for your identity card, complete with the names of your father and mother, a declaration of the money you carry, your certificates of vaccination, and a "Personal Declaration of Origin and Health" on which you must indicate where you have spent the fourteen nights preceding your arrival. They do not

add the indiscretion of asking you *with whom* you have spent these last fourteen nights. That will come, no doubt.

Even this is not all : at one place they take your pulse and make you stick out your tongue, and at another place you have to pass some of your pounds Sterling to a pal if you have been honest enough to declare that you possess more than five. And so on. This trip again confirmed my opinion that the formalities on the ground are the evils of air transportation, an evil which may ultimately kill this form of transportation, at least on short stages (it has practically done so already on certain Continental routes such as Paris—Brussels and Brussels—Amsterdam ... to the great benefit of the railroads).

The day when the "Facilitation Committee" of ICAO will have done away with all these "services" and installed showers in the premises now occupied by them—how we would like to deal with bathing attendants rather than with customs officials—the Committee will have rendered civil aviation a *real* service and earned its own name !

The Useless Precautions

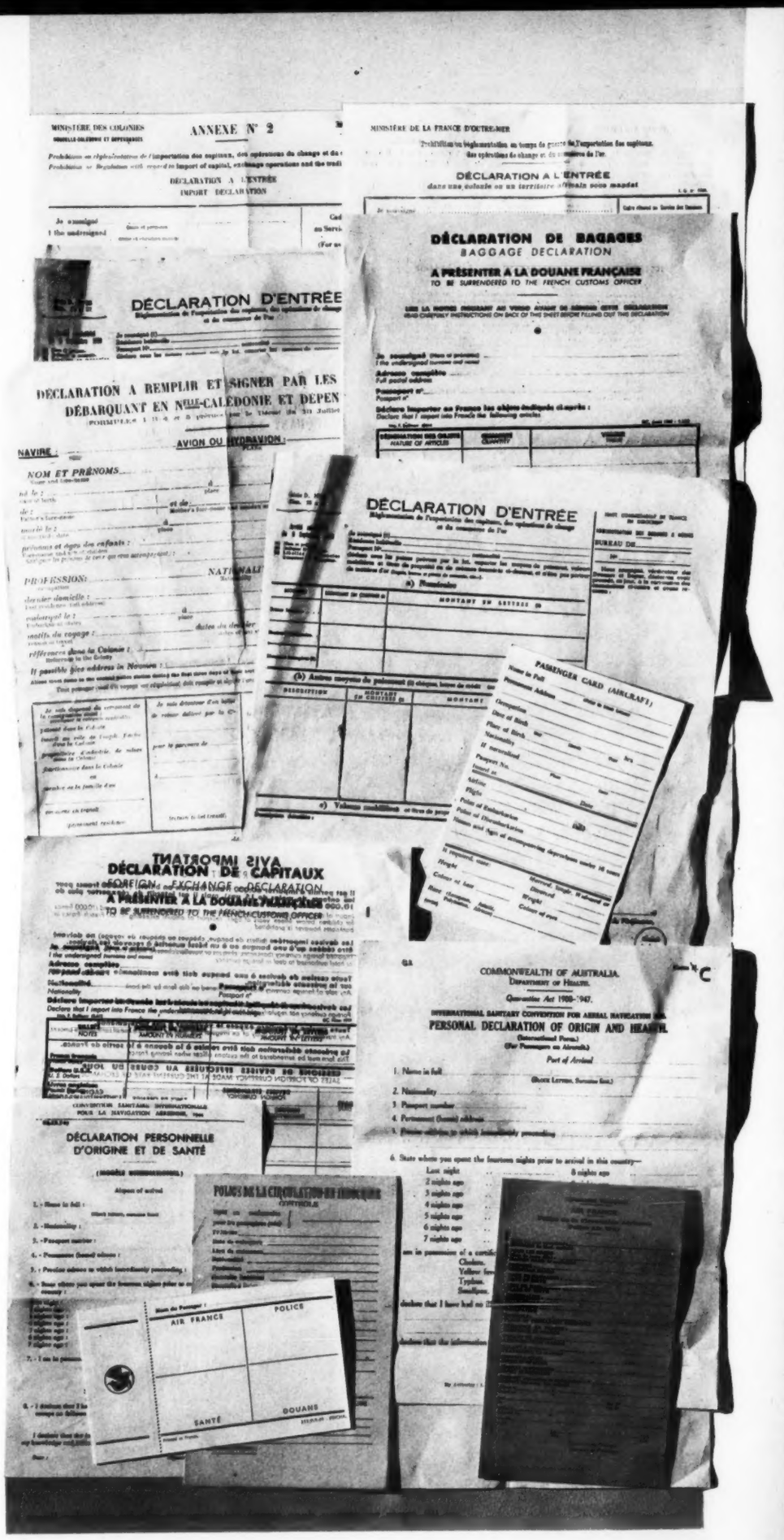
These tedious and tiresome formalities are the more irritating as they serve no practical purpose. At Calcutta, for example, you are asked for your vaccination certificates as you board the aircraft — so that, if you are a carrier of germs, you have had time to infect all of India. At Jakarta you are asked about the money in your possession, down to the last penny—but you must not spend anything, and you don't have a chance because you don't leave the airport. All you do is to walk from the aircraft to the restaurant and from the restaurant back to the aircraft. There is absolutely nothing to buy or sell.

All this is ridiculous. If the passport, issued with all the necessary care, visas and guarantees, is sufficient, why should not an international treaty make the country of origin responsible for the misdeeds of its nationals ? A single form per passenger, comprehensive and including details of identity, health, money carried, contents of travelling bags could be established prior to departure. The purser would merely have to have them checked off at each stop.

Two Stops

For diffrent reasons two of the stops on the "longest line in the world" merit particular mention.

We arrived at Port Darwin from Saigon after 15 hours of flight, having covered more than 2800 miles with one stop of barely an hour at Jakarta. Temperature and atmosphere



resemble a Turkish bath, it is the middle of the night ; we are hoping for a shower and a bed.

There are few diversions in this place, which greatly resembles a Western gold rush town. Then, after a good half hour of waiting —they have nothing but time at Port Darwin— the customs chief establishes the order (probably by drawing straws) in which the passengers are to be inspected. And then each passenger, including those in transit, has to have *all* his suitcases examined.

The books you read, your toilet soap, the color of your socks, and the brand of your toothpaste all interest the customs inspector greatly.

This detailed and careful examination seemed a little exaggerated even to me. What type of "racket" could you run in this hick town lost in the North Australian desert ? I was curious enough to ask the customs officer what he was looking for.

"Nothing," he answered, "it's just routine."

The sultry night, spent in a room with three beds at the Port Darwin Hotel, with a mosquito-net that was incapable of preventing the onslaught of bugs of all kinds, did not help me to stomach this explanation.

At dawn the next day Captain Lanata put down our DC-4 on the runway at Aitutaki.

This little island in the Cook Archipelago is a pin point on the map. It is hardly bigger from the air. Encircled by yellow sand and a brilliant green lagoon, it is only a minute green spot in the deep ultramarine of the Pacific.

What customs officials, what police were going to welcome us here ? We pressed our noses against the windows... And we got the most astonishing, the most sensational of surprises : no cantankerous customs officers, no inquisitors, but young smiling girls all dressed in white who came to greet us at the aircraft, singing and dancing, their arms full of leis and wreaths of flowers which they placed around our necks and on our heads.

Welcome by the "customs agents" of Aitutaki.

In the little white airport building, which was decorated with palms and foliage, a royal banquet had been prepared for us : grilled pork chops, roast chickens laid out on large banana leaves next to opened coconuts with their fresh milk. And everywhere fruit, flowers, smiles... And in place of the harsh orders over the public address system, the soft music of guitars and ukuleles strumming songs and dances for our pleasure.

What a difference from Port Darwin ! It is true, of course, that the natives of Aitutaki are savages. However, one would wish that a delegate of the Cook Islands be made Chairman of the Facilitation Committee...

The Paradise at the End of the World

But Aitutaki is only the entrance to this "paradise at the end of the world," which comprise the Society Islands and the Leeward Islands, islands of picturesque and extraordinary beauty, with a mild climate which induces smiles, songs, and dances that almost make you completely forget that you must earn your daily bread by the sweat of your brow.

Their remoteness—45 to 50 days by sea from any port in Europe—and boats are rare—has kept them as they were in the days of Cook and Bourgainville without being spoiled by "civilization." By opening them to international tourist travel—I know of nothing in the world which can compare to their natural beauty—will aviation destroy them ?...

It is certain that Air France is going to bring hundreds and hundreds of European and American tourists to Bora-Bora and Tahiti who will be travelling to Nandi, the airport of Viti-Levu, in the Fiji Islands, which are already the crossroads of the Pacific since the aircraft of NAC (New Zealand National Airways Corporation), BCPA (British Commonwealth Pacific Airlines), PAA (Pan American World Airways), CPAL (Canadian Pacific Air Lines) and Air France meet there now.

The customs officials of Bora-Bora.

Adventure in the Pacific

But I must not tempt you yet : it is too early to reserve your ticket. The line will not be open for several months until radio stations and beacons and weather stations have been established.

At the moment, certain fields are only safe during the day—we had to wait at Nandi before taking-off, so as not to arrive at Aitutaki or Noumea before dawn. The facilities of these Pacific airfields are very poor and are not yet adequate for regular traffic.

Fortunately the pioneers of Air France were former sailors, for they had to follow the reefs, spot the lighthouses, to come down into squalls producing readings of 1,500 to 2,000 feet per minute on the rate-of-climb indicator, and all this with a ceiling of only 400 feet.

As he was flying the "Catalina" which took us from Papeete to Bora-Bora, Pommier told me of one of his trips.

With Castel, he took off one night from Nandi for Faleolo. Met. was bad and he flew "on the deck." The air was rough. After several hours, Nandi, which had contacted Faleolo, told him of conditions ahead : crosswinds of 40 knots, storms, 800 foot ceiling and visibility of 800 yards. And the message ended : "We will let you know if you have to turn back."

"Okay," answered Pommier, "but not after such and such time because by then I shall have run out of gas..."

"H" hour had long passed when Nandi came through to tell him that conditions ahead were much worse and he would have to return.

It was too late : they would either have to get to Faleolo or go into the drink, to use the correct expression.

For four hours, flying just above the waves, fighting through two terrible fronts, with the ceiling never above 400 feet, Pommier flew with the strength of despair. He finally put down, crosswind, on the grassy runway at Faleolo. It had rained so much that he gained the impression his "Catalina" was afloat.

Two Weeks in Paradise

These times are gone. Tomorrow radio ranges, beacons, radar and GCA equipment will bring regular airline schedules to the Pacific. Once again the aircraft will have slashed the size of the world, this world which has already become so small that when you leave Paris on a cool spring night you are plunged into the humid heat of the Far East thirty hours later. You sipped an *apéritif* at the Café de la Paix, and now you are among yellow faces and almond eyes, jostled by rickshas and water carriers. The junks on the Mekong have replaced the little sailing boats.

Several hours more, and you see the peacefully smoking volcanoes of Indonesia, the uninhabited desert of Northern Australia, the riviera of the Pacific at Noumea, the lacustrine villages of Fiji and the incomparable atolls of the Paradise at the End of the World.

Like Pierre Loti and Alain Gerbault, you go to discover these islands yourself. No deception awaits you, for the islands have not changed, they are the same as—perhaps even better than—they have been described.

Magic colours, bewitching scents, everything has a dreamlike quality. The music you hear, the flower-laden boats that come to greet you...

To find this paradise you must fly. The heavy jasmine scent will dispel the odours of the 100-octane gas.

But it used to take six months to make the round trip to Tahiti. Now four weeks of vacation will be sufficient to be able to spend two weeks in Paradise. They are not selling you time, as Air France's famous slogan claims. They sell you joy and life, which is ever so much better.

And when you leave (if you leave : your return ticket is good for one year) and you follow the ancient custom of taking your leis off and throwing them into the sea, do not have too many regrets—you will return.

Tahiti...

What the Passenger Sees

There were 45 people aboard. But the forty-fifth, even though he travelled alone, hardly counts : he was six weeks old ! His mother had placed him in the arms of the hostess with instructions to deliver him to his grandparents in Karachi.

All the women's hearts were moved.

The youngster can be tranquil, he will not lack hands to give him his bottle or to . . . change his diapers.

*

The steward, with his impressive moustache and baritone voice, first introduces the crew and himself and then reads out the menu : duckling, lobster, chicken, endive, cheese, pastry, fruit—not to mention the apéritif, champagne, and brandy.

The beginning is good. And I had promised myself to lose weight on this trip . . .

*

We arrive in Cairo at night.

"Then we shall not see the Pyramids ?"

"No, not unless we crash into them . . ."

There are two fields serving Cairo : Al Mazza and Farouk. To avoid colliding with other aircraft, at the latter they make

Mail from Paradise.

left-hand turns and at the former they turn to the right. Pilots who miss the field don't care for this. In addition they must avoid the Royal Palace as it is forbidden to fly over it.

For not having done so, our pilot, Gambade, was banned from Cairo for three months.

"I was not to blame," he said, "the Palace is not on the map."

Why are airport "curio" stores such places of horror and bad taste ?

I shall never forget a fawn-coloured leather briefcase with a yellow sphinx, a blue Nile and green coconut palm. I would pay a lot for not having to buy it.

The crew leaves us.

Do we have to continue by our own resources ? Me, who has never flown anything bigger than a Morane.

*

On the airport boundary, at the end of the desert, two hundred Curtiss "Commando" transports, souvenirs of the war, are rotting. Tethered there for five years.

Right there was an air cargo fleet big enough for all of Europe . . . such is peace-time economy.

*

Yellow, yellow, yellow. Everything is yellow, the sand, the dunes, the mountains . . .

And finally blue : it is the southern entrance of the Suez Canal where the boats are queuing up.

And they say that rationing no longer exists.

*

Sand dunes as far as you can see, with an occasional protruding rock. No trace of grass, not the slightest drop of water. Pedestrians must feel thirsty.

Steward, a large glass of ice water, please, and a bottle for the baby !

*

The brilliant yellow and white of the vast expanses of sand, mixed with the green and blue of the sea, makes you think of one of Picasso's gouache paintings. That's the Cape of the Pirates in the Persian Gulf. In bygone times the shipwreckers, armed with lanterns enticed the merchantmen to these inhospitable shores. Luckily they didn't think of buying GCA equipment to do their job . . .

*

There are masses of landing fields in the vicinity of Karachi. The remotest one, of course, has been allocated to the civil air lines.

Karachi's administration building resembles that of La Guardia Field on a smaller scale. It is guarded by soldiers and policemen armed to their turbans. Suddenly they rush forward. An aircraft lands. Greyhounds and horses are unloaded. Poor things. They had to travel in a "Tudor."

An admiral, including decorations.

The Society for the Protection of Animals seems to be getting negligent.

*

We are having dinner. We sleep. The lights of Calcutta begin to flicker over an area vaster than that of Los Angeles.

The Hindu porters, dressed in white, form our guard of honour. As soon as you get out from the aircraft you feel like entering the hammam, the Turkish bath. The air is cooler under the punkahs of the administration building, and there the vagrants of the whole country seem to sleep the sleep of the just in the armchairs, on the benches and on the floors. The money exchange agent doesn't sleep. He gives you 4 rupees and a few annas for a dollar, 12 rupees for a thousand French francs, 13 for a pound Sterling.

This shows that Britain has left, but not quite.

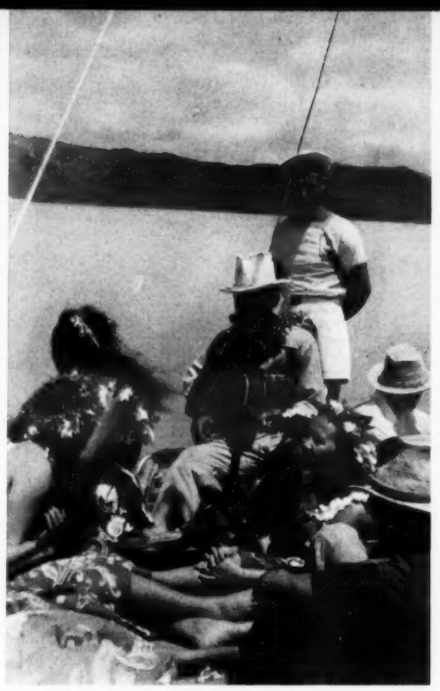
*

Another take-off. Another engine check. Another passenger list, seemingly lengthened in direct proportion to the increase in heat . . .

Why can't one do all these things beforehand ? The aircraft would come along and pick up its passengers without stopping the engines. A covered ladder would be all that is needed . . .

During this time the passengers could have rattled off their own little litanies : passport, visa, vaccination, foreign currency, police form, contents of luggage. Even so it would be the crew who would have to wait.

*



A boat *does* have its charms.

A night's rest (?) at Saigon. You simply must go to Cholen. Chinese dinner—shark fin soup and putrid eggs. First class. Then a visit to the hangout of the high society. At the entrance a male and a female employee search male and female guests, respectively, for guns. Those who want to gamble their piastres must do so without artillery. As if roulette, dice and the lottery would make them think of pistols and hand grenades.

At the "Paradise" the little Chinese taxi-girls do their stuff. They dance and they look bored, at twenty piastres per tango.

Curfew—you have to go back. The Rue Catinat, a favourite spot of Claude Farrère, the Liars' Cape, the Loafers' Cape are deserted.

On the other bank of the Mekong they are loading their mortars . . .

*

Bad luck, we are approaching The Line, the sky is clouding over.

We are flying over clouds and shall not see the Equator.

*

Neptune nevertheless gets out his cotton beard, his crown, and his gilt cardboard trident. And by stuffing large quantities of salt into your mouth and squirting fizzy water down your neck he baptizes you and everyone in sight . . .

Including the Right Reverend.

*

I shall not make the acquaintance of Batavia—beg your pardon, Jakarta—but only of the restaurant at Kemajoran Airport and that astonishing succession of red roofs divided by two canals—a souvenir from Holland.

*

We are supposed to pass in the vicinity of Bali, the island of the girls with the beautiful breasts.

My binoculars have a considerable range, and I therefore attempt to bribe Lanata to make a little detour. He isn't interested. Perhaps he has a girl friend waiting for him at Port Darwin.

So I put my glasses away again.

*

There are no porters, no elevators, no bathrooms at the hotel in Port Darwin, and no breakfast after 8 : 30 a.m.

Nandi or Nadi ? The international airport of the Fiji Islands, the aerial hub of the Pacific.

The runway at Bora-Bora isn't very long...

On the other hand, there are three beds to each room. They all have to be occupied . . . by people of the same sex, of course.

*

The Australian desert. A vast expanse of nothing. Even a skilled writer finds it difficult to write something about nothing.

*

Brisbane. Another night on the Pacific coast, and then Noumea, with its Kanakas.

*

Everything changes, red blossoms are everywhere, weird bushes, mangrove trees on which grow . . . oysters. Anyway, their roots are down in the sea, and the oysters are on the roots.

That's the Riviera of the Pacific, or that is what the Caledonians say. So far as the beach is concerned that may be correct, but

The Hôtel du Pacifique at Noumea hardly can stand comparison with those of Palm Beach.

the banquets at the Grand Hotel of the Pacific cannot compare with those at the Palm Beach.

*

Nandi doesn't fall short of Somerset Maugham's Pago-Pago. Rain, rain . . . and more rain. The houses are built on stilts and the airport is equipped with raincoats which are lent to passengers as they walk out to their aircraft.

Water everywhere, too much of it. All the same I have to pay threepence for the plain water for my whiskey.

*

Twelve hours out of Paris. We are at the Antipodes.

I expected walking would be more difficult.

*

Here we are, at Aitutaki.

Papeete is beautiful even in bad weather.

You know how one makes a gun ? You take a hole and pour some steel around it. Aitutaki is made on the same principle. They took two runways running at right angles and dumped a little earth along them on every side.

*

After the songs and dances of welcome we are given a cocktail, which is produced by cracking coconuts with a machete.

I am also offered for sale such things as chinaware, seashells so beautiful that they look artificial.

"But I don't have any of your local currency."

"That is of no importance. Perhaps you have a watch you don't need . . ."

"No, unfortunatly I don't have that either."

". . . or an old pair of sandals. Or nothing at all . . ."

Civilization, evidently, is very far away.

*

It is hot. Let's have a swim in the laggon.

"What about the sharks ?"

"You are afraid of sharks ? Not me." Then seconds later the courageous bather rushes out of the water.

"Got bitten by a shark ?"

"No . . . but look here, at this thing, here . . ."

And with a trembling finger he indicates the reason for his terror . . . a little black crab with red eyes which in turn has died of fright . . .

*

View of Papeete harbor.

We are received at Aitutaki in the same way as Captain Cook must have been. One of my anti-militarist friends says that Cook was the only Captain that ever deserved to be promoted Rear-Admiral, because of the mackerels in the cans which bear his name.

*

What did I do in Tahiti ?

This is supposed to be a *travel* diary, you know.

*

The Douglas DC-4 is left at Bora-Bora. A member of the crew stays behind to guard it. He also is appointed guardian of the liquor store.

Four days later, upon our return from Papeete, we find that 80 bottles are missing from the galley. The whole village is drunk, and our guard has acquired a harem of 13 women.

For the next trip the whole of the crew and passengers have volunteered to stay behind at Bora-Bora.

*

I have some sleep to catch up. I am very tired. We began by shortening the nights, flying east, then we passed the 180th Meridian and missed a day completely. You don't sleep much in Tahiti. My notes on the return trip will be brief.

Too bad. Or very good. Take your choice.

*

We have a lot of leis and wreaths and flower garlands and seashells when we leave Papeete. Our "Catalina" finds it difficult to take-off.

When you leave by boat you throw your flowers into the sea so that they float back to the shores and make sure of your return.

Nothing doing in an aeroplane. The scent of these flowers is so strong that we nearly stifle. So we squeeze our beautiful leis into paper bags—those bags which . . . you know, those bags, well those bags, you sometimes use in bad weather. A sad end for the beautiful flowers which graced your neck.

*

Aitutaki, as charming as ever. Nandi, as wet as ever. Port Darwin, as annoying as ever.

Tambora volcano smokes like a pensioned fireman.

"At what time shall we arrive at Jakarta ?"

"At eight hours ?"

"Eight hours from where ? From Port Darwin ?"

"Not at all, you have to advance your watch by an hour and a half. It is 4 : 45 hours."

"I still have Greenwich Mean Time. It is now 20 : 45 hours . . ."

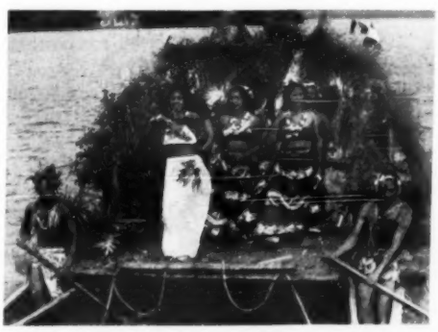
"What day ?"

"Yesterday, of course."

"And the 180th Meridian, what do you make of that ? You have 20 : 45 hours of the day before yesterday . . ."

*

Fourteen hours difference between Papeete and London, two crossings of the date line, that's more than enough for all the passengers to play their little Einsteins.



* * *

There is only one man who doesn't go off his rocker : Jean, the purser, whose name on the route will be as famous as those of George or Mac on other lines, who with his two Anamese stewards plies us with food and drink—and what food—always at the right moment.

*

Not a cloud in the sky. I saw the Equator, a nice black line in the telescope. I saw two volcanoes, smoking peacefully like two pensioners. Which they are.

Then I got back to Saigon, with its damp heat and its mortar grenades. At last we set out again for Paris, at great speed. And all that is left to me are the impressions of colours.

The valley of the Nile and the desert which begins like a seashore. An endless competition : green vegetation against sand.

*

Then, snow. I had forgotten it had existed. It is difficult to believe in its reality after Tahiti, but there it was, on Crete, on the heights of Italy and Corsica. The red colouring of the Roches Rouges in the blue of the Mediterranean.

Finally, the vast gray expanse of Paris, my Paris.

Home, sweet home.

This Miserable Little Peninsula

Europe and her Treaties

There was no lack of speeches, letters, and congratulatory cables. Banks, of blue and yellow flowers adorned the conference hall of the Netherlands Army's headquarters, the Princess Juliana Barracks at The Hague, to welcome the guests who, attired in morning coats and glittering uniforms, arrived on April 4th, 1950, in their shiny "*Corps Diplomatique*" cars.

The first anniversary of the *North Atlantic Pact,* which was marked by meetings in the Dutch capital of the Defence Ministers of the signatory nations, the Military Committee and the North Atlantic Military Production and Supply Board, was not the only diplomatic anniversary to be celebrated in 1950. The *European Recovery Program* (Marshall Aid) and the *Brussels Military Pact* of the Western European nations entered upon their third year in the weeks preceding Easter, whereas the *Mutual Defence Assistance Act* (U.S. arms aid to the European Atlantic powers) and the *European Council of Strasbourg* will mark their first birthday.

Pacts are being concluded in rapid succession. There is no need to worry, however : diplomats and generals keep their diaries up to date and can be relied upon not to miss the anniversaries of any of these events.

Birthday Toasts

But it is depressing to discover that the music composed for all the official festivities revealed dissonant tones in every country. The result is that the musical accompaniment as a whole suspiciously resembled a very slow march written by Chopin.

The Defence Ministers' Committee of the twelve North Atlantic powers met in The Hague on April 4th for a remarkably brief conference. It seems that all decisions had previously been elaborated in detail and were ready for signature.

General de Monsabert, the veteran French soldier, is at present writing a series of articles for "France Illustration," under the significant title, "Malaise de l'Armée." He discusses the military preparedness of the French nation and its armed forces, and he thoughtfully asks :

> "Do we fully understand the rôle which France is to play in the defence of the West ? Does our defence policy reflect our treaty obligations ? Is our domestic policy designed to prepare the nation for an extreme emergency ? Let us face it : those who have eyes in their heads will notice the flagrant contradictions and inefficiency in the conduct of our national affairs."

Holland, whose military experts have pronounced an extremely pessimistic verdict on the preparedness of the nation's defences, reportedly had requested additional arms supplies in the value of 65 million dollars already prior to the beginning of the negotiations in The Hague. Apparently the Dutch aroused little enthusiasm among the American delegation. In the United States General Eisenhower himself has warned that the strength of the American defences has dropped below the danger point.

But the most cordial congratulations on the anniversary of the Atlantic Pact were expressed by Winston Churchill who put the following question to Defence Minister Shinwell in the House of Commons on April 5th :

> "It is not lamentable that with all this well-turned-out official verbiage, and with all these meetings of great consequence between the most important people in all the different parts of the world, so little real progress should have been made in making a front and a defence in the much more than twelve months that has elapsed since the Atlantic Pact was signed ?"

And Defence Minister Shinwell replied :

> "I am sure the Right Hon. Gentleman would be the first to admit that in so short a time real progress has been made."

Two assertions which exclude each other. Who is right ?

From the Charter to the Pact

Let us recapitulate the evolution which crystallized the aims and led to the conclusion of the American-European pacts. The Atlantic Charter which Franklin D. Roosevelt and Winston Churchill signed aboard the American cruiser "Augusta" on August 12th, 1941, was the negation of a military alliance. The charter was intended to prevent the formation of *blocs* anywhere in the world. Its aim was to guide the still vigorous spirit of a defunct League of Nations into new channels and to open the gates to a paradise of unarmed peace to the war-weary peoples of the world :

"... a peace, after the final destruction of the Nazi tyranny, which will afford to all nations the means of dwelling in security within their own boundaries, and which will afford assurance to all peoples that they may live out their lives in freedom from fear and want."

The events that followed are well-known. Four years of war which drove the Allies to the brink of an abyss, conferences which gradually drove the Anglo-Saxon West and the Russian East farther apart, cessation of hostilities without well-defined agreements, haphazard division of the world into spheres of influence, a United Nations Organization which succeeded neither in organizing nor in uniting the nations, vetoes, futile conferences, exchange of irritated notes, blockades. Finally the frantic quest for new, more destructive weapons. The wheel had turned full circle ; the world was back where it had started.

In Western Europe, which had disarmed materially and morally, a twilight spirit prevailed in 1947 despite all appearances of prosperity. And the signature of the Brussels Defence Pact by Great Britain, France, Belgium, Holland and Luxemburg on March 17th, 1948, the creation of a joint defence committee, of a Western European military high command at Fontainebleau and of a standing arms production board did not change the fact that not a single one of the European nations possessed a defence force worth mentioning. They have no divisions, no weapons, no industry capable of supplying even the most urgently required equipment within a useful period of time. The situation has been stationary for some time.

General Pierre Billotte, who for four years held the appointment of Chief of the French Military Delegation to the Security Council of the United Nations and who a few weeks ago resigned from the French army in order to regain his freedom of action, outlines this state of affairs in an article he published in "Revue de Paris" (April 1950) under the heading "Défense de l'Europe" :

"It cannot be repeated often enough : this Europe, which still is free for the time being and the defence of which is under discussion, is nothing but a miserable little peninsula when measured by the yardstick of a modern global conflict, a peninsula on which weighs the whole Eurasian land mass and the whole military might of the Soviet Union."

*

By elaborating the Atlantic Pact and—before it—the Marshall Plan, the United States and Canada aimed to bring about a fundamental change in this disastrous situation. Western Europe was to be seized by its hair, so to speak, and withdrawn from the quicksands in order to be put on its own legs once more. A beginning was to be made in the economic field. That it would be a historical falsehood to describe the American-European treaty system as an agressive military alliance is illustrated by the single fact that at the time of the signature of the Atlantic Pact only one of the twelve partners (*) was physically able to enter into military obligations, and the military capacity of even this single partner would be subject to certain qualifications.

The Conference of Ministers was preceded by meetings of the Military Production and Supply Board and of the Military Committee. Left to right : General Omar N. Bradley, the American Commander-in-Chief ; General Crittenberger, U.S.A. ; General Baele, Belgium.

The text of the allegedly "purely militaristic" Atlantic Pact stipulates that priority over military obligations must be given to the settlement of economic sources of conflict between the contracting partners and to the organization of a free exchange of goods amongst the allied nations. When President Truman on July 25, 1949, pronounced his message urging the ratification of the Pact by Congress, he referred principally to the economic program outlined under the Marshall Plan. It would be a contradiction of the most elementary common sense to interpret the Atlantic Pact as a plot forming the prelude to a campaign of aggression and conquest.

As its preamble points out, the Atlantic Pact was destined—following the failure of all efforts to introduce an element of mutual confidence into international relations—to make the peace clause of the Atlantic Charter available to as many nations as possible. Combined with the Marshall Plan, the Atlantic Pact is a direct continuation of the Atlantic Charter by other means. Its purpose is to enable the Atlantic nations to live "in freedom from fear and want." Today's discussions are concerned merely with the method of distributing the cost of this insurance policy. For nobody will blame the United States for not being prepared to foot the bills run up by the whole Western World until the end of time.

In December, 1949, the Defence Ministers had met in Paris. Picture shows the Defence Ministers of the major Atlantic countries. Left to right : René Pléven, France ; A.V. Alexander, Britain (since raised to the peerage) ; Louis A. Johnson, U.S.A. In the background (between Pléven and Alexander) the Administrator of the American Arms Aid programme, James Bruce.

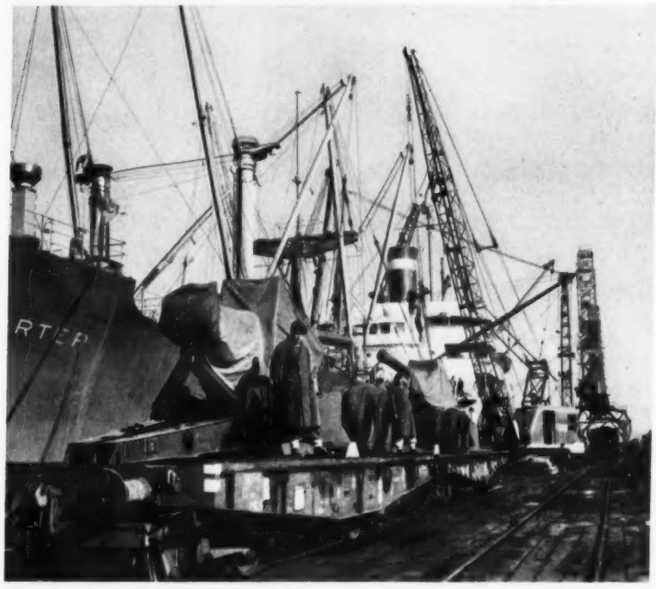
Time is More Than Money

With considerable emphasis the Americans have repeatedly made it clear what they understand by economic and arms aid, what they wish to see and what they regard as undesirable. A practical example is furnished in the field of aviation politics.

At the end of January, 1950, the head of the British Joint Services Mission in Washington, General Sir William Morgan, returned to the United States after having spent some time in England. No doubt as a result of his conversations with the general staffs of the three British armed services he told the Americans that progress was being made continuously, but "many years" would pass before the standardization of British and American military equipment would be an

* U.S.A., Canada, Iceland, Norway, Denmark, Great Britain, France, Belgium, Holland, Luxemburg, Portugal, Italy.

American weapons, for the "Miserable Little Peninsula" :
On April 2nd, 1950, the French aircraft carrier "Dixmude" landed at Bizerta, Tunisia, with 48 American naval aircraft.



Despite Communist demonstrations, an American "Liberty" freighter unloaded 630 tons of war material at Cherbourg on April 13th, 1950.

A gun is unloaded.

accomplished fact. "Many years" may have sounded a little too long for the Americans. At any rate, eight weeks later Marshal of the Royal Air Force Lord Tedder, the successful R.A.F. commander and Deputy Commander-in-Chief of the Anglo-American armies in Europe during the war, who at the end of 1949 retired from the post of Chief of the British Air Staff, was appointed Chairman of the British Joint Services Mission in Washington and simultaneously British delegate to the Military Committee of the Atlantic Pact organization. In the latter capacity he has become a member of the High Command of the Atlantic nations which was formed on October 6th, 1949. This joint command is headed by General Omar N. Bradley, of the U.S. Army, and includes as the third member General Paul Ely, Chief of Staff of the French Air Force. In practice this triumvirate guides the military destinies of the Atlantic nations and works out all military measures to the point where they merely have to be approved and signed by the Conference of Defence Ministers.

Another example. For the last two years a military command of the five Western European signatories to the Brussels Pact has been in existence at the Château de Fontainebleau. This high command has distinguished itself less by its military decisions than by its clever court intrigues. The result is that the defence conference of the Atlantic nations at The Hague thrived without the Fontainebleau High Command. The command was not even invited to take part in the conference.

What do the Americans want ? This is easily expressed in four words : *something for their money.* Promises which may come true after "many years" do not arouse their enthusiasm. Do not let us delude ourselves : there is a gaping abyss between the American and the European mentalities. The Americans have no time for the European maxim that the treasurer must hold his tongue as soon as the general takes over. The Americans are not familiar with that trance-like state in which the nations of Europe have a tendency to fall immediately they are confronted with the proverbial "shining armour." On the contrary, they believe that a system of uncooked bookkeeping and auditing of expenses is indispensable if the problems of building up the nation's defences, the nation's air force, the nation's aircraft industry or the nation's airline system are to be solved efficiently.

On Checking our Books . . .

A summary idea of the amounts which the European Atlantic nations are spending on their mutual defences is furnished by a compilation of the latest budgetary defence allocations.

Fiscal Year	*Country*	*Defence Costs National Currency*		*Defence Costs* U.S. $
1950-1951 (Estimates)	Britain	£	780,820,000	$ 1,950,000,000
1950-1951 (Estimates)	France	Fr. frs.	420,000,000,000	$ 1,370,000,000
1949-1950	Netherlands ..	Fl.	518,594,148	$ 119,500,000
1950-1951 (Estimates)	Belgium	B. fr.	8,200,000,000	$ 163,000,000
1948-1949	Denmark ...	D. kr.	295,000,000	$ 31,700,000
1950-1951 (Estimates)	Norway.....	N. kr.	2,526,000,000	$ 271,000,000
1950-1951 (Estimates)	Italy	Lire	323,000,000,000	$ 489,000,000
				$ 4,394,200,000

This list does not take into account the currency devaluations which have taken place in the meantime. The figures refer party to expenditure during the coming fiscal year, partly to allocations already made for the past year. The defence budgets for Portugal and Luxemburg are not available. All this is insignificant, however : the sole purpose of this table is to provide a rough idea of the size of European defence expenditures. The table shows that the European member nations of the Atlantic Pact require about $4,500,000,000 for defence purposes. Added to these figures must be the American arms aid which in the U.S.A.'s 1950-1951 defence budget figures at about $1,148,000,000. Thus, the aggregate amount of money spent on Western European defence in one year totals about $6,000,000,000 or nearly half the sum the U.S.A. spends on her own armed forces.

What is the effective result of the expenditure of these six-thousand-million dollars ? The French General Pierre Billotte sums it up in a single phrase :

The man who initiated the Marshall Plan : *General George C. Marshall*, with Mrs. Marshall at his home at Pinehurst, North Carolina.

The American Marshall Plan Ambassador for Europe, Averell Harriman.

The Administrator of U.S. aid to Europe, *Paul Gray Hoffman*, former President of the Studebaker automobile corporation, who defends Western Europe's interests with great personal courage and repeatedly threatened to resign if Marshall aid to Europe were curtailed.

This building is the European focal point of American Marshall Aid. The Château de la Muette in Paris, seat of the Organization for European Economic Cooperation.

" This amount is today being squandered without any concrete return."

And the American General Lucius D. Clay declares :

"Today no *one* of the free countries of Western Europe is economically able to provide all-round defence. Yet each is trying to—wasting vast sums of money and manpower in an effort that ends in ineffective air forces or ineffective ground armies or ineffective navies. It is a case of a little of all—and a lot of nothing."

It is difficult to contradict these men if it is considered that scattered all over the globe the Atlantic nations have at their disposal not more than forty more-or-less operational divisions of greatly differing combat value. The Soviet Union has about 175 cohesive divisions forming an integrated force ("Newsweek," April 10th, 1950). And it is a shock to learn that the Western nations, in order to achieve this disappointing result, have enrolled in their land forces a total of 2,000,000 men, which is not much less than the 2,500,000 in the Soviet army.

It is evident, of course, that the effective strength of these forces can be assessed only very summarily and that the divisions of the Atlantic powers normally are larger than those of the Russians (which during the war sometimes comprised only 6,000 men). On the other hand, only about fifteen out of the West's forty divisions would be available for immediate combat operations in Europe in the event of an emergency. And the most depressing feature of it all is that this completely insufficient fighting power has not increased in the course of the last twelve months. There is no military expert that would deny that the number of available divisions is exactly as small today as it was when the Atlantic Pact was signed.

Who is to blame ? Two independent military sources in the New and in the Old World blame a fallacious air strategy for this state of "*laissez faire, laissez aller.*"

"*American Atomic Blitz*" *or* "*Neutrality of Europe*"—*Two Cases of Wishful Thinking*

„The American Congress and people seem not fully to have realized what obligations they have undertaken."

This sentence is taken from the initial paragraph of an article in which the American Bernard Brodie criticizes the tendency of attaching exaggerated importance to the "Bomber Concept" ("Strategic Implications of the North Atlantic Pact"; The Yale Review, December, 1949). The extreme advocates of strategic air war, who form a considerable portion of America's strategists, are described as being violently opposed to the Atlantic Pact. Two years ago they still believed that they could not do without an advance aircraft carrier in the form of the British Isles, but today they have written off Europe altogether and have replaced it with the B-36 long-range bomber, pilotless guided missiles, the atomic bomb and the polar bombing concept. Air bases on the European Continent do not only seem superfluous but would lead to an irresponsible dispersal of America's fighting power. Brodie explains that the bomber "which carries its logistics with it" will remain wishful thinking for a long time. Range,

President of the Council of OEEC is *Dirk Uipco Stikker*, Dutch Foreign Minister.

The Secretary General of OEEC, *Robert Marjolin*, of France, declared in the second report on the European Marshall aid organization, published recently, that from an economic point of view the nations of Europe were on the right road. This shows that some people still believe in Europe.

From his hospital bed, ailing *Senator Arthur Vandenberg* wrote a letter to Marshall Plan Administrator P.G. Hoffman to express his concern over the lack of progress made by the European nations in the coordination of their national economies.

Marshal of the Royal Air Force Lord Tedder retured from the post of Chief of Air Staff of the R.A.F. at the end of 1949 and in April, 1950, was appointed Chairman of the British Joint Services Mission in Washington. Together with General Omar N. Bradley, U.S. Army, and General Paul Ely, French Air Force, he forms the high command of the Atlantic powers.

Operation "Agility Two." In the late autumn of 1949 joint manoeuvres of British, French, Belgian, Norwegian and American army and air force units took place near Hanover in Germany. The picture shows a tank parade in the Sennelager, near Hanover.

bomb load, armament and bomb aiming accuracy do not meet the requirements that must be fulfilled by a global bomber. Apart from that, strategic air warfare could not prevent the Russians from seizing Europe's industrial potential. He agrees with Walter Lippman, the American journalist, that the Soviet armies cannot be cornered by air attack, not even with the atomic bomb. Their supply industries can always be dispersed in the Siberian wastes or—this would be even more painful—in Western Europe, where the Russians could requisition the European industrial and war potential.

So much for the Americans. What does the European expert have to say ? Curiously enough he declares that those responsible for the destinies of the old world have been caught in the same trap. The only difference is that they have arrived at a diagonally opposed fallacy from the "Bomber Strategy." General Pierre Billotte accuses the chiefs of the European defence effort of clinging to a mirage. A Russo-American war would be waged via the North Pole, they believe, and Europe could therefore stay neutral.

> "One thing must be stated very clearly : for thousands of years the war-like campaigns of the peoples have moved along the globe's parallels. In the remote future lies the age of strategic blows across the Poles, blows which will be delivered by vastly improved scientific weapons than we possess today. For a long time Western Europe will lie across that military highway along which Russia's will for world domination will have to march to grapple with its American opponent. Open or concealed neutrality of Europe would by no means spare the Old Continent the terrors of war."

Too Much Honour

Regretfully we hold the view that General Billotte overestimates his Europeans. A definite, though fallacious, plan for Europe's neutrality would certainly give food for thought, but it would be much less harmful than the real reasons for Western Europe's failure. These reasons are lack of planning, outright laziness, inefficiency, unability, vanity, megalomania, and an irresistible love for conferences, organizations, super-organizations and, last but not least, for the old "shining armour."

We shall not go into detail because we do not wish to vex those who might remedy the situation. There is little point in irritating people : they should be encouraged to take action. There is no time to lose.

Many Europeans, and not the most unworthy ones, believe that the majority of the American public clings to an attitude of resentful isolationism. As a result, Europe was being deprived of the aid to which it is entitled in the best interests of the Western democracies.

In World War II the Frenchman Saint-Exupéry, one of the most famous aviation writers, who lost his life with the Royal Air Force, expressed similar ideas which were public property at the time. In December 1943 he wrote to the French General Z. (from "Antoine de Saint-Exupéry," by Pierre Chevrier ; Gallimard, Paris, 1949) :

> "Without beating about the bush I declare to the Americans : it is you who are responsible for our defeat. We were a people of forty million farmers fighting against an industrialized people of eighty million... We were ready to take on a foe twice our size, we were ready to die. But to ensure that our sacrifice made sense, you should have given us the 'four' guns, the 'four' aircraft which we lacked. You wanted us to keep the Nazis away from you, but you continued to produce your Packard cars and refrigerators for your week-end needs..."

The American addressed in this manner might have replied : there were forty million of you, you say ? What about the forty-two million British, the Belgians, the Dutch, Norwegians, Danes ? The British, French, Belgian industry ?

Here you have the tragedy of Europe...

It is certain that the American Congress, like any other popular assembly, contains a destructive element which, driven by some form of incomprehensible fanaticism, sometimes produces the most extraordinary flowers. Quite recently it showed its capacity for mischief by introducing the well-known resolutions concerning the affairs of Southern Ireland. Such occurrences are rare, however.

The responsible American opposition, as well as the great majority of the American people and the Congressmen of the party in power, carefully checks every dollar of the Marshall and mutual arms aid programmes to be allocated to the European nations. Nobody will take this amiss, not even the Europeans. On the whole, the Republican opposition concentrates its efforts on ensuring that the time limit set for this assistance (1952 for the Marshall Plan, year by year for the military aid programme) be observed. Why ? Simply because it believes that a stimulant is necessary, that the European nations must be kept on their toes. Is this the attitude without foundation ?

The originator of the Marshall Plan, General George Catlett Marshall, declared in Washington on April 3rd, 1950, that he has repeatedly had to emphasize the immense importance of carrying out the American aid programme within its originally specified limits. Suggestions aiming at turning America's economic aid programme into a system of alms must be rejected by the American people. He believes that the closing date for economic aid, namely, June 30th, 1952, should be adhered to in order to encourage the peoples of Europe to emancipate from American assistance as quickly as possible.

Manoeuvre pause : *General de Lattre Tassigny*, of France, and *Lieutenant-General Sir Charles Keightley*, General Commanding the British Army of the Rhine.

Arthur Henderson, Britain's Secretary of State for Air, welcomes the American crews of the first B-29s landing at Marham.

Similar thoughts were expressed by ailing Senator Arthur Vandenberg, one of the most responsible leaders of the American opposition. From his hospital bed he wrote a letter to Paul Hoffman, the Marshall Plan administrator, in which he appealed to the nations of Europe to remove the present bureaucratic obstacles, such as customs and other barriers, within the shortest possible time.

The same note is struck in all the debates at the Atlantic Defence Conference in The Hague, where General Bradley emphasized that the concept of individual national sovereignty will have to be subordinated to higher aims in the interest of collective security.

*

General Omar N. Bradley has placed his finger on the weakest point of Europe's defence and economic system. If the European partners of the Atlantic Pact continue to place their "sacred" rights of national sovereignty in the way of the requirements for a mutual defence organization, the "miserable little peninsula" will still have the same number of divisions a year from now as it had when the Atlantic Pact was concluded.

It is rejoicing to note modest beginnings of a potential improvement. The countries of the Brussels Treaty have agreed to certain administrative facilitations regarding the travel and exchange of military personalities. They have just created a supra-national unit for the training of military pilots, the headquarters of which will move from one member nation to another in yearly rotation. They have organized joint manoeuvres on land, on the sea and in the air, with alternate high commands.

These beauty marks do not make any decisive contribution to the urgently required face-lifting operation. Numerous measures are of the greatest immediate importance—and immediately practicable. They include, in the civilian field : opening of the frontiers, reduction in the bureaucratic apparatus of every nation, establishment of customs unions, creation of a liberal economy without which none of Europe's national economic systems will be able to survive ; in the military field : establishment of a single high command, which does not have to consult with two or three bodies of equal status but issues straightforward orders.

Many of the decisions taken in The Hague probably will be withheld from the public for years in order to ensure the secrecy necessary in the interest of general security. But the few disclosures which have been made so far seem to indicate that all members agree on the necessity for a strict organization and centralization of the joint military effort. Within the scope of the joint defence organization, a specific task will be assigned to each of the Atlantic nations. It would be conceivable, for instance, that long-range strategic rôles would be allocated to the United States, the air defence of Europe to the British, the organization of the ground forces to France, etc. It is evident that any mutilation of the defence forces of individual nations would have to be avoided and that these forces should comprise the services and equipment necessary for independent action. In a paper read before the Royal Empire Society in London in November 1949, Marshal of the Royal Air Force Lord Tedder declared that it would be completely erroneous to equip the Royal Air Force with nothing but fighters and fighter-bombers under the Atlantic Pact organization. In many cases the strategic bomber has proved to be the best defensive weapon, and the Battle of Britain was only won when it had been turned into the Battle of Germany.

The division of military duties must therefore not be over-simplified in any circumstances. On the other hand, a division of duties and the establishment of an authoritative high command will be necessary if one is to avoid that ancient mistake which has deprived so many a historic coalition victory.

*

The first installments of military equipment are arriving in Europe from America under the military assistance programme. On April 2nd the French aircraft carrier "Dixmude" landed 48 American naval attack aircraft at Bizerta. In Naples an initial quantity of American war material was unloaded in spite of the Communists' much-vaunted "preventive measures." Great Britain has already received some of the seventy Boeing B-29 "Superfortress" heavy bombers allocated to the Royal Air Force.

All this equipment would be wasted if Europe's defence organization continued to remain ineffectual.

For the people in the East have not rested on their laurels. At the time of The Hague Atlantic Conference a meeting of Soviet military leaders and military commanders of the Satellite countries took place in Budapest. Russia is reorganizing and expanding the Chinese armies. She is supplying the Chinese Communist government with aircraft and pilots.

The aircraft industries of all European Atlantic powers have a combined output estimated at not more than two to three fighter aeroplanes a day, the lion's share of which is contributed by the British industry. The Soviet Union alone is producing at least ten fighters a day.

How much time is there left for the "miserable little peninsula" ? General Billotte closes his article with the words :

> "Within a few months, within two years perhaps, the Soviet Union will possess all the instruments of war which it will need—if we continue to be idle—to undertake the necessary strategic actions on all fronts which will allow her to face the final conflict..."

The first four of seventy Boeing B-29 "Superfortress" four-engined bombers allocated to the Royal Air Force arrived from the U.S.A. at Marham R.A.F. Station, near Norfolk, in the middle of March, 1950.

"I have never been scared"

"*Si tu n'as jamais eu peur, tu es un fada !*" or, in classical English, "If you've never been scared, you're nuts !"

This profound statement is used currently only in Marseilles. It expresses a universal truth. Personally, I am convinced that those who have never been afraid are not all there. They have no imagination. That is unfortunate for them, for to "foresee" something is one of the most admirable displays of intelligence.

So far as I am concerned, I must admit that I *have* been scared. Not too often, but nevertheless on quite a number of occasions. Chief of all on those whose issue seemed uncertain. I wasn't scared, for example, when the wing of the "Lionel de Marmier" flying-boat, with a gaping hole instead of one engine and with another pendulating in space with an idly wind-milling propeller, wobbled violently up and down at its extremity. The catastrophy seemed inevitable. I was not frightened because I had made up my mind that I had "had it."

There have been other times when things were not quite the same, and I would like to tell you the story of the biggest scare I ever had. It started at Istres.

It was in 1937, I believe. I had watched, as the special correspondent for the newspaper *L'Auto*, the start of the British, Italian and French aircraft taking part in the Istres—Damascus—Paris air race.

After the last take-off I had gone to file my story to Paris. I had to wait for a long time for the call, and the stenographer was not very fast. Anyway, when I came back to the tarmac, all the aircraft returning to Paris had gone.

Next morning's Air France service was sold out, and it was too late even to catch the Marseille—Paris express somewhere down the line. But I simply had to be back in Paris, at Le Bourget Airport, to report on the arrival of the aircraft. I came back to the mess, where my friends copiously plied me with liquor to make me forget my worries. Around three o'clock in the morning we were all feeling extremely well. At that moment one of the guests, whom I didn't know from Adam, walked up to speak to me . . . with an unbelievable Italian accent.

"Wanta go back-a to Paris ? Si ? Yes-no ? I hava da place in my aeroplano."

"A seat ? You are the answer to a maiden's prayer." I must have been slightly gone, for I usually get the jitters when I ride in an automobile driven by somebody else. And here I was going to fly with a man I had never seen before.

"Bene. At the five o'clock before da hangar . . ."

After several other and exceedingly superfluous drinks, after three quarters of an hour of restless sleep in a decrepit armchair, I appeared at our rendez-vous. I was no longer drunk, but I had a hang-over and wasn't very proud of myself.

The Mistral blew like a gale when "my" pilot showed up. I helped him to trundle his aircraft from the hangar. It was a very small Fiat bi-plane. At that moment I became convinced that we would never get to Paris.

"Me, I don'ta feel so good," said my companion, "I feela da giddy, da horrible aches of da head. But everyding is okay. Da air will do me da good."

There wasn't any lack of air, I must say.

There was a parachute in the aircraft, only one. He put it on. And he installed me in the forward seat. To my horror I discovered that the dual controls had been romoved.

My latent concern changed to intense fear. I was quite sure that sooner or later he would bail out and leave me to my miserable fate without a chance of getting away with it. But stupidly I didn't dare to back out. There wasn't even a seat strap in my cockpit, and on my knees I was to hold my pal's suitcase, a suitcase which I shall never forget in the whole of my life, a suitcase covered with shiny black leatherette. "You know da way ?", my pilot asked, pulling out a set of Michelin road maps. "You follow da Rhône so far as Lyons, from Lyons you follow da Seine. And I musta getta da gasolina at Lyons."

My fate was sealed. I thought he was going to take-off downwind, the Mistral pushed us so hard. But he turned around, and thirty feet later we were in the air. Bumping from one bump into the next. Never again have I seen the sun and felt such turbulent air conditions at the same time.

And I continued to die with fright, particularly because without seat straps I risked being tossed out of the aircraft any moment. So I held on to the cockpit side like grim death and miraculously managed simultaneously to prevent that famous black leatherette suitcase from flying out. I was bruised for weeks.

From time to time I squinted backwards to see if my Italian hadn't jumped out yet. He was still there. My tiredness and my fright engaged in a terrific struggle. I slept for half a minute. During those thirty seconds I dreamt of hell, devils and ghosts. "Premonition" I thought, "I am going to die." And I woke up in a cold sweat.

Apart from that I felt violently sick. Incidentally, it was the only time I have ever been unwell in an aeroplane. I vomited continuously over the black leatherette cover of the suitcase which, while still holding on to the cockpit sides, I kept on wiping sadly with my handkerchief.

The wind was still blowing at about 60 miles an hour, and we made no headway. Every time we flew over a small town of that rugged Rhône valley, my pilot pointed downwards with his forefinger and hollered, "Lyons ?"

We were nowhere near it. My fright began to stabilize itself when the engine started to produce an occasional splutter.

"Going down", shouted the voice behind me. "Finish da gasolina."

Frantically I looked out for a likely place. Nothing but rocks, hills, fields as big as a handkerchief. More and more I become convinced that he would jump.

"Thatsa where we land . . ." my pilot suggested. The point he indicated was the glass roof of a factory. "No-no-no-no, anywhere but," I shrieked.

The engine spluttered and coughed with increasing frequency. Suddenly it stopped, and the airscrew was but a motionless piece of wood.

With my finger I pointed to a fair-sized field surrounded by trees. Very skillfully he managed to catch his landing gear in the branches. The Mistral, the good old Mistral brought the aircraft back into a more normal position, and we crashed into the field right side up, wrenching off the undercarriage.

I was on the ground. On the ground, I tell you. And alive.

In spite of a few scratches and a bump as big as an egg, I chucked out the suitcase and got on to the grass.

Stretched out on that cow pasture I felt good, but good !

My pilot rudely awakened me from my dream. "De undercarriage she is gone," he said, "We shall not get to Paris tonight."

"That's all right," I said, "I shall take the train."

"Dis is da eighteenth time I make-a da forced landing in da pasture, eight times good and ten times bad . . ."

"And you've never jumped by parachute ?"

"But sure, fiva times !"

I had escaped by a hair's breadth. We were just outside Vienne. I don't sulk, and so I went off with "my" pilot to celebrate our interrupted voyage with a sensational feast "chez Point." And I brought back more memories from this trip than from ten flights across the Atlantic Ocean.

But never again I flew with a pilot whom I didn't know.

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Book Reviews

Hirth — Erfinder, Rennfahrer, Flieger (Hirth—Inventor, Speedway Rider, Aviator), by L. Heiss. — Published by Verlag Reinhold A. Müller, Stuttgart, 1949.

Three men with strenuous careers are the heroes of this book : Albert Hirth (1858-1935), the father, who from a restless inventor and his sponsors' problem child evolved into a successful industrialist ; his son, Hellmuth (1886-1938), who started his aviation career on a Etrich-Rumpler-Taube in 1911 and ended it as a well-known aircraft engine manufacturer ; and his brother, Wolf (born 1900), in earlier and more peaceful years a motor cycle racing champion, world-renowned sailplane pioneer and powered-aircraft pilot, today the head of a group of industrial companies. Ninety years and four Continents are embraced by this triple biography which, as a human document, as a thrilling adventure and flying book and as a contribution to the history of engineering, of aeronautics or Swabian industry, absorbs the reader and makes him forget the wearisome aspects of daily politics. (German.) *T.*

Air Touring Guide to Europe, edited by the Private Aviation Division of the Fédération Aéronautique Internationale, Royal Aero Club, London.

This handy book, produced "with the intention of assisting the international air tourist to fly around Europe with as much enjoyment and as little bother as possible," is recommended to all private pilots for the wealth of valuable information it contains. This covers such items as Customs Carnets, Refuelling Carnets, Aircraft Clearances and Permits and all the other documents a private pilot must carry when away from home. It also features a brief but useful international aviation vocabulary (English, French, Italian, Dutch, Spanish, Portugese, Swedish, German) ; maps and descriptions of the main European routes, with the necessary navigational data ; details of all the utilizable aerodromes (Customs, controls and restrictions, runway types and lengths, servicing, meteorological, radio and night landing facilities, obstructions, accommodation, etc.), followed by a selection of aerodrome approach charts ; a summary of the most important R/T frequencies at aerodromes ; landing, hangarage and refuelling costs ; tables for converting English measurements into metric, and a list of seasonal sunrise and sunset times. (English.) *Sa.*

L'Hypothèque Aérienne, by Bernhard Hofstetter (Doctor's thesis, Lausanne University). — Published by Imprimerie Centrale S. A., Lausanne, 1950.

The vast expansion of the international civil air services since the war had made the problem of the possibilities of mortgaging aircraft a very urgent one. All the same, it took three-and-a-half years from the Chicago Conference (December 1944), before an international agreement on the subject was concluded. This fact alone indicates the difficulties which are encountered in the elaboration of any legislation dealing with material rights in aircraft. This is confirmed by the knowledge that the Geneva negotiations of June, 1948, did not get around to discussing an international standardization of national regulations, but that the twelve participating countries were forced modestly to limit their ambitions to an agreement to respect their individual national legislations, even though some of them are widely divergent. From the point of view of material rights the situation therefore remained practically unchanged. The confusion of different types of mortgage—French mortgage, Italian mortgage, English mortgage, American mortgage—was not unravelled in any way. A comparative study of mortgage rights in aircraft therefore was an urgent necessity, all the more so since the Geneva Agreement again tends to meet American requirements and is more unwieldy than one would suspect when reading its smooth text.

In his exposition of the national and international basis of rights in aircraft the author proceeded very thoroughly. *L'Hypothèque Aérienne* by Hofstetter is one of those books which remove numerous difficulties from the path of international understanding. A very careful bibliography indicates a Lausanne school of thought. (French.) *He.*

Die Grundlagen der Verkehrswirtschaft (Second Edition), by Carl Pirath. — Published by Springer-Verlag, Berlin-Göttingen-Heidelberg, 1949.

Dr. Carl Pirath, Ordinary Professor at the Institute of the Transport Sciences at Stuttgart University, is not unknown to readers of *Interavia.* Nor does the Second Edition of his *Grundlagen der Verkehrswirtschaft* (Fundamentals of Transport Economy) require any introduction. Prior to World War II the book was rightly considered in Germany as one of the fundamental analyses of the whole of transportation. It is to be underlined that the author, despite Germany's material and intellectual isolation of the war and postwar years, has been able to keep up with modern developments. Transport experts all over the world will derive substantial benefit from this work (120 illustrations and 2 tables). (German.) *He.*

Mécanique de l'Aviation ; Propulsion et Performances, by Pierre de Valroger.—Published by Gauthier-Villars, Paris, 1950.

"This work comprises the indispensable minimum of knowledge with which every aircraft engineer must be familiar today." To many this claim, put forward in the introduction to the book, may sound somewhat bold, but a more thorough examination of the contents will convince most that it is a fact. On 389 pages de Valroger has condensed the lectures he has read at the Ecole Nationale Supérieure de l'Aéronautique in Paris. The author does not indulge in protracted, purely mathematical dissertations but employs, where ever possible, much simpler and more rapid graphical methods for the solution of a great variety of problems. This is a principle which is often used in practical engineering, and it also is the reason why de Valroger's work is bound to arouse the interest of the practical engineer.

Special mention may be made of the chapter on aircraft propulsion. It deals with important problems of propulsion by turbine jets, ram-jet engines and rockets, as well as the design and arrangement of jet engine intakes with special reference to boundary layer effects. The author points out that at high speeds the overall efficiency of turbine jets approaches that of ram-jet engines and emphasizes, on the other hand, that ram-jets will not be suitable for use at unlimited speeds. A chart in the appendix shows that the overall efficiency of a ram-jet engine at speeds of Mach 3.0 and above rapidly drops from 0.52 to 0.—Of particular interest is also the chapter on rotary-wing aircraft. Following a brief recapitulation of various types of rotor design, it discusses the highly topical problems of jet-driven rotors.

Measurements are based on the MTS System (fundamental values are length, mass, time), in accordance with French standardized practice. (French.) *Ba.*

A Yakovlev Yak-11 light trainer flies over the headquarters of the Chkalov Central Aero-Club in Moscow. It is this club which represents the Soviet Union within the Fédération Aéronautique Internationale, the organization grouping most of the world's national sporting flying clubs.

Russia's Nationalized National Sport

Soviet Russia is paying more attention to sporting flying and allied air sports than ever. Russia's "aerial sportsmen"—thousands of lightplane pilots, thousands of "civilian" parachutists, thousands of aircraft model-flying enthusiasts—from an immense reservoir of semi-qualified and easily trained manpower ready to be drawn upon in an emergency. Aviation not only has become the Soviets' national sport, but it also is a strictly *nationalized* sport. Here lies the fundamental difference between *private* flying in the Western countries and *sporting* flying in the Soviet Union. In the West anybody who is not a congenital invalid or imbecile can take out a private flying licence if he has the necessary small change. In the East you don't have to pay any money, but you must have the qualifications needed to turn you into a soldier as soon as the necessity arises. In the West a private pilot wearing glasses is quite a common occurrence. We would like to see a short-sighted sporting pilot behind the Iron Curtain! And in the West we would be surprised to see thousands of private individuals doing their 150th or 200th parachute jump simply for the pleasure of it.

Even before the war Soviet "sports pilots" performed feats which in the "reactionary" world

Workmen and office employees of Moscow's industrial enterprises and administrations, as well as college students, train daily at the Central Aero-Club. Picture shows training aircraft taxiing to the runway.

A Yak-11 trainer flying over Moscow's river terminal building. This type of aircraft is rapidly being replaced with more powerful Yak-18 and Yak-21 trainers.

Flying over the pleasure boats moored near the river terminal on the Moskva.

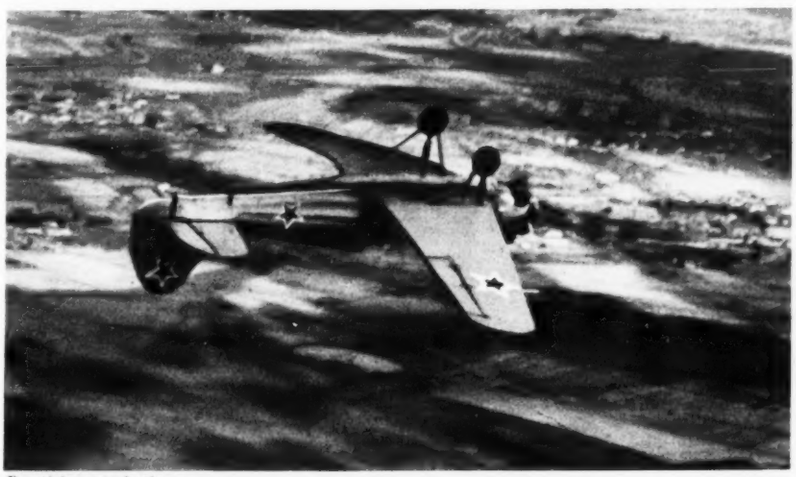
Girl members of the Central Aero-Club—pilots of powered aircraft and sailplanes. Left to right : Zoe Mareva, Lucie Tsars, Marguerite Ratsenskaia, Nina Loghinova, Zinaide Sofronova.

One of the most active female powered aircraft and glider pilots of the Club is Marguerite Ratsenskaia.

would look more like military achievements. As long ago as 1937 Soviet "sporting aviators" flew nonstop from Moscow to the United States, passing over the Polar ice cap. Some of the crew members of the aircraft making those flights have meanwhile become Soviet Air Force generals.

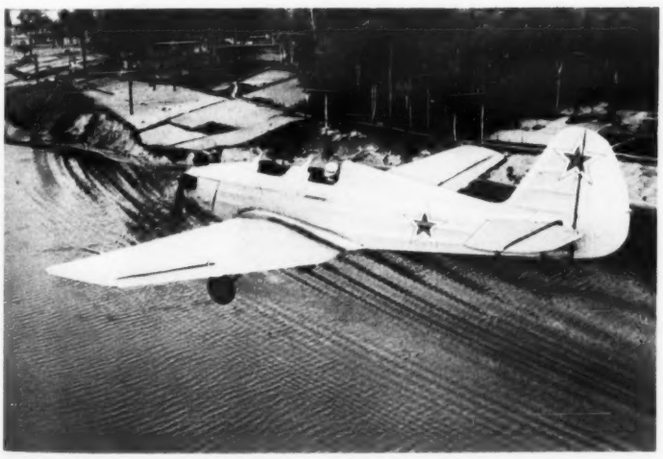
World War II has shown the tremendous importance of the air arm in a military conflict. It has persuaded the Russians to create the greatest air power in the world (cf. November, 1949, issue of *Interavia Review*). And these plans have given tremendous impetus to Soviet "sporting flying." Male and female light plane pilots, glider pilots, balloon pilots, parachute jumpers, aircraft modellers are undergoing regular training in every part of the country. "Sporting flying" records are set up on every possible occasion.

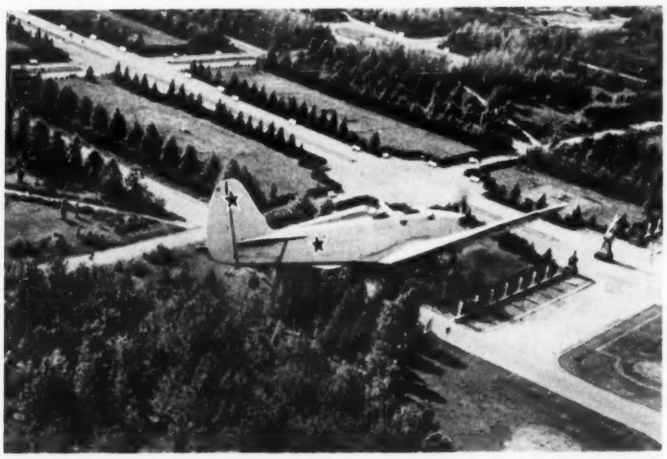
In the middle of last November Major-General Richard Hilton, former British Military Attaché in Moscow, stated that the Soviet Union is making even its remotest village air-minded and was amassing a flying reserve of tremendous proportions. The



Practicing aerobatics.

Cross-country flying pratice. At left is one of Moscow's parks.





Ivan Prokopenko is one of the chief instructors at the Central Aero-Club.

Vasili Pavlov is one of the Union's best-known sporting pilots and takes part in every Air Display organized annually in Moscow on Soviet Aviation Day.

Above, right :
Formation flying practice.

Sailplane flying is another sport actively pursued by the Central Aero-Club. Vasili Nedashkovski is one of the Union's most famous soaring pilots.

Parachuting seems to be firing the imagination of the Russian "civilian" more than most other activities. The Union is reported to have 150,000 trained parachutists, civilian and military. Shown here is a parachute training tower.

people's civil flying organization, D.O.S.A.V. (which stands for Dobrovolnoie Obstshyestvo Ssodyeistviya Aviazya SSR, or "All-Union Society of Voluntary Assistance to Aviation") was working on a scale far exceeding anything else done along the same line in the world. It was quite possible that the trainees may some day be used in war "in forms which may seem impossible to our hidebound way of thinking." This statement is corroborated by the fact that in 1935 there were 135 flying clubs in the Soviet Union, a figure which increased to nearly 400 by the end of 1948 and has risen since. Also at the end of 1948 there were 27,000 active glider pilots in Russia, and training has gone on incessantly.

How thorough D.O.S.A.V. is in its activities is illustrated by the fact that it is even going

The pilot has given the signal and Alexei Nochevnyi, a student at Moscow industrial college, prepares to make his 152nd jump. The aircraft is a veteran Po-2 biplane trainer.

Alexei Nochevnyi opens the first of his two parachutes...

... and deflates the two 'chutes after landing.

Inspection of parachute gear prior to going aloft for a jump.

as far as organizing competitions for the design of trainer and sporting aircraft. One such competition, announced in the middle of last year, provided for ten prizes ranging from 10,000 roubles to 40,000 roubles and was open to individual participants as well as to groups of designers. In the field of parachutist training, a strict set of regulations providing for varying ranks of civilian parachute jumpers has been established. A "masters jumper" is a parachutist who has carried out at least 50 jumps from different altitudes ; 387 master jumpers were registered in the Union earlier this spring, most of them with well over 150 jumps and five with more than 1,000 jumps.

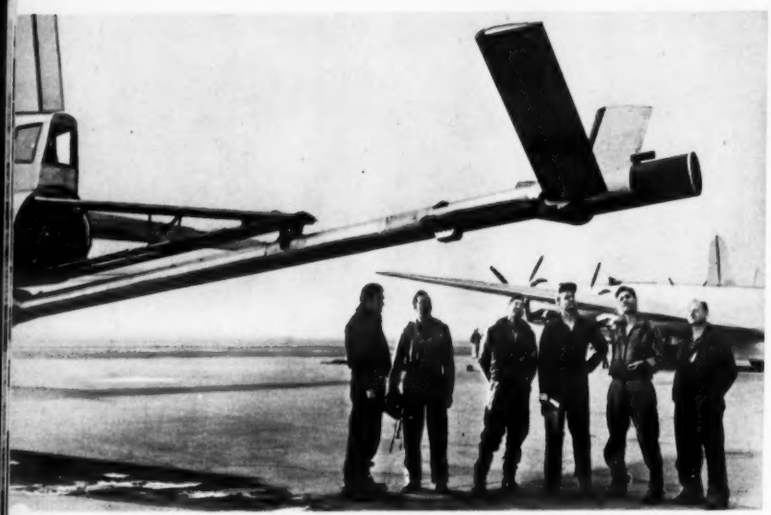
President of D.O.S.A.V. is Lieutenant-General Kamanin, of the Soviet Air Force (!), who also is one of the best-known Soviet aviation writers ; Chief of the organization's Gliding Division is veteran Soviet gliding instructor I. A. Pietrov. Secretary-General of Moscow's Central Aero-Club, member of F.A.I., is Major-General Smirnov, noted Russian pilot and "Hero of the Soviet Union."

How some of the Russian aviation sports enthusiasts spend their training time is shown on these pages.

And the aero-modellers : Aircraft model competitions are held every year in all parts of the Soviet Union. Ildus Mavliukov, a pupil at No. 12 school at Kazan, built a model which flew 14 miles and reached a height of 3,000 ft.

Right :
In the foreground Instructor Ivan Makushin starts a powered seaplane model in the vicinity of Kazan.

Yuri Okroev is a pupil in the seventh grade at Tbilisi. His model stayed in the air for 1 hr. 40 mins. and reached an altitude of 5,500 ft.



Below the tail of the tanker, a converted Boeing B-29 "Superfortress," a light metal tube several yards long is flexibly attached ; in its interior there is a telescopically retractable extension tube. During the take-off and the flight to and from the rendezvous, the "pipeline" is maintained in a horizontal position by means of an outrigger protruding from the fuselage tail.

The tanker has taken off, met the bomber which must be refuelled (from which the picture was made) and flies ahead and above it. The refuelling boom is lowered on a cable, and the telescopic tube with the pipe coupling is extended.

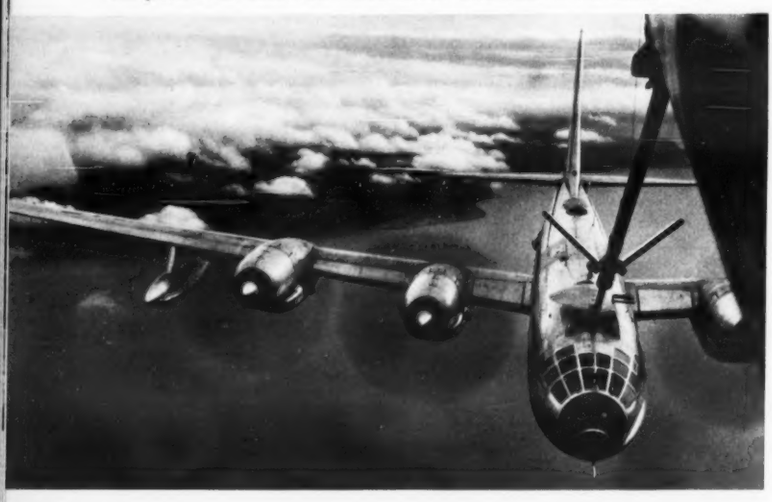
The Flying Pipeline

The idea of refuelling an aircraft in flight and of thus increasing its range was applied practically—but experimentally—by Sir Alan Cobham as long ago as 1936. The use of this principle in the air offensives of World War II was not essential, however, since at least in the European theatre of war nearly every mile to the target areas was over enemy-held territory. Nor did it seem feasible for flying tankers to replenish the fuel supply of all aircraft of a large formation shortly after take-off or on their way home from a mission. This was so because the in-flight refuelling method required, apart from precise rendez-vous of bombers and tankers, a protracted manoeuvre with tow cables, harpoons, catch lines, and fuel hoses.

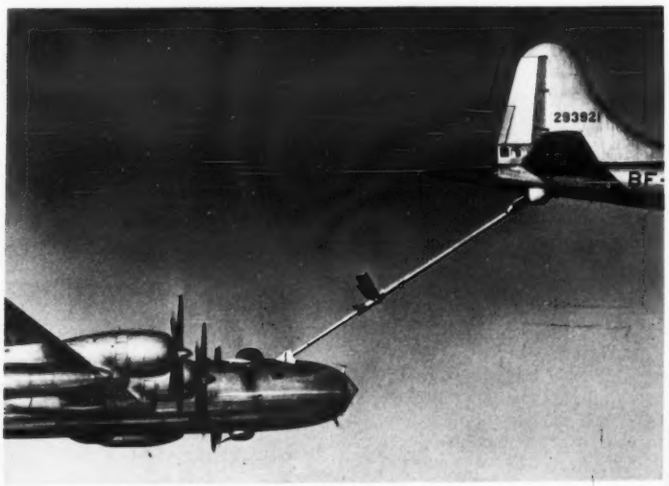
Slogans such as "global air warfare" and General Spaatz's "one aircraft, one bomb, one city" indicate that the situation has changed. Modern air strategy will base itself on extreme distances covered by small formations, so that refuelling of aircraft in flight has become a much more practical proposition than it was during World War II. The U.S. Air Force therefore seriously took up Cobham's refuelling method and has developed it to a much more advanced point. The non-stop round-the-world-flight accomplished by the "Lucky Lady II" a year ago with the assistance of four refuellings over the Azores, Arabia, the Philippines and Hawaii was a brilliant demonstration of the practicability of the method rather than a final proof of its usefulness, for "Lucky Lady" could easily have landed at any or all four points for refuelling, whereas, conversely, the tankers would have been unable to carry out their task if the four bases had been non-existent. But the range of fully loaded medium bombers, such as the Boeing B-29 and B-50 "Superfortress," can be extended by about 50 per cent if the aircraft are fuelled to their maximum capacity shortly after take-off, which eliminates the need for "refuelling airports" far removed from the home bases. This means that the range of medium bombers can be extended to resemble that of the heavy Convair B-36. The accompanying pictures, recently released by the U.S. Air Force, show how simple in-flight refuelling has become in clear weather and calm air conditions. No harpoon, no manoeuvring with cables and lines. Instead of the long hose pipe there is a short, articulated telescopic boom mounted under the tail of the tanker. And while the free end of the hose used to be roughly as controllable as a child's box kite guided by a piece of string, the boom has now been fitted with airfoils and can be "flown" by a special "pilot" in the tanker with great precision until it reaches the fuel intake opening of the bomber flying below and aft of the tanker.

The "pilot" of the boom now takes over. By means of a control stick he operates two airfoil surfaces fitted to "Vee" position the end of the tube—similarly to the "butterfly tail" of the Beech "Bonanza" they replace elevator and rudder units. Like the tail of an aircraft the pipe is raised or lowered or moved from side to side by the air stream.

The end of the extension tube finally slides into the open, triangular hatch in the upper side of the bomber. There it is connected with the main fuel intake pipe, and the pump aboard the tanker rapidly supplies the desired quantity of fuel to the bomber. The picture was taken from a lateral observation dome in the tanker.



Both aircraft seen during the refuelling process. Owing to its telescopic design, the refuelling pipe extends or contracts as the aircraft approach or move away from each other. The dark leading edge portions on the airfoils of the refuelling boom are Goodrich rubber deicers with imbedded electric heating wires.



The "Blue Angels" approach the airfield preparatory to executing their breath-taking reverse echelon barrel roll.

Crowds of people line the airfield. The sun beats down mercilessely. A small cloud of blue smoke goes up here and there as someone lights up a cigarette or pipe. Now and then someone laughs. The wide open space dampens the talk of the hundreds of men, women and children to a mere murmur. Occassionally someone turns to scan the horizon all round the field.

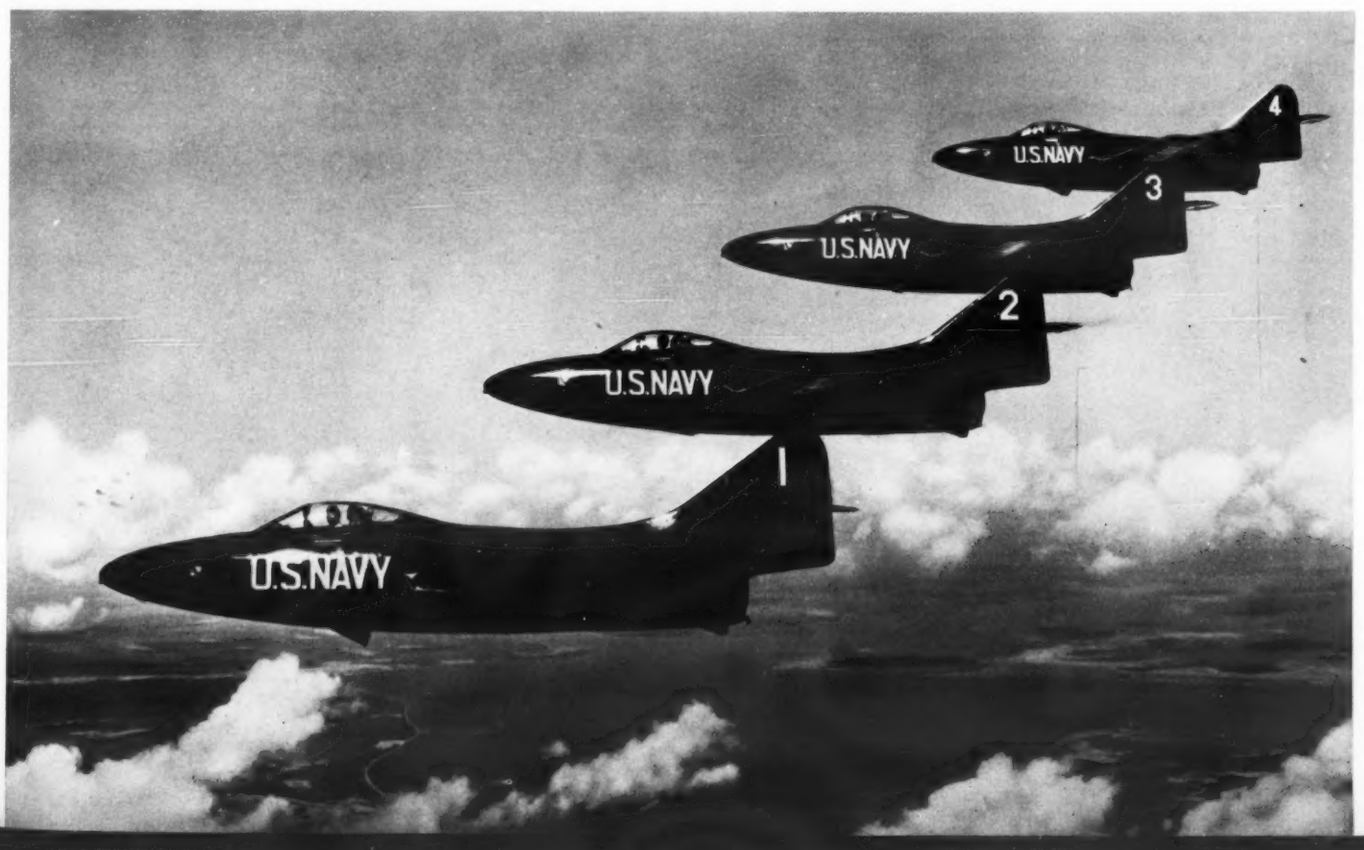
An almost imperceptible, simultaneous movement goes through the mass of people, like a slight breeze through a wheat field. A voice shouts, "Here they come !" The cry is taken up all around, heads turn rapidly from left to right. A faint whine, four tightly tucked shadows sweep low over the runway ahead of the crowd, a thunderous roar—four specks in the distance. Gone.

The "Blue Angels," crack jet aerobatic team of the U.S. Navy, are in town to show what they can do. Their name was invented at Cleveland's National Air Races in September 1946 by a reporter who thought that the blue-and-gold painted fighter aircraft showing off their paces presented a somewhat unearthly type of flying. "Blue Angels" stuck and has since been adopted as the official title of the Navy's Flight Exhibition Team.

For the pilots making up the "Blue Angels" *are* an exhibition team. The unit was formed in 1946 at Jacksonville naval air base, Florida, for the express purpose of acquainting the public with the kind of flying which is taught in the Naval Air Training Command. No barnstorming stunt flyers, the "Angels" demonstrate precision-acrobatic manoeuvres and basic fighter tactics with which all U.S. naval aviators must be familiar. What gives their routine a breath-taking quality is the extremely low altitude—just a few feet above the "deck" —at which they perform their manoeuvres.

Yet, their flying appears much the same as

The U.S. Navy's Flight Exhibition Team in perfect echelon formation.



One of the most colorful personalities of the "Blue Angels" was Lieutenant-Commander R. E. "Dusty" Rhodes, third leader of the team until he was succeeded by Lt.-Cdr. Magda last January. He was shot down by a Jap during the battle of Santa Cruz in 1942 and was fished out of the Pacific by a Jap destroyer thirty hours later. The rest of the war he spent in Japanese prison camps.

"We'll rendez-vous at this point and start in from here," former leader "Dusty" Rhodes explains to Lt. Longworth, Lt. (j.g.) Roth and Lt. (j.g.) Hoskins just before take-off.

The Grumman F9F "Panther" at present equips the "Blue Angels." From the wing-tip tanks coloured water is released and vaporizes on contact with the air stream. Each tank in the formation is alternately filled with red, clear and blue water which is released by all four aircraft simultaneously at the beginning of the diamond barrel roll.

that of three daredevil Navy pilots of many years ago, when Lieutenants D. W. Tomlinson, W. V. Davis and A. P. Storrs first formed the "Sea Hawks" for the purpose of impressing the local countryside. But where the "Sea Hawks" flew mostly for the thrill of it and were often feeling their way, testing the strength of men and machines, today's precision acrobatic flyer knows exactly what his machine can do. He knows the limits that are placed upon himself and his machine, and even though his speed has advanced some five hundred miles an hour and his manoeuvres are more spectacular, his performance is much safer than that demonstrated by the "Sea Hawks."

The "Blue Angels" are composed of six pilots and twelve crewmen who always accompany the pilots by transport to make on-the-spot repairs if necessary. Each of the crewmen is a specialist in some phase of jet operation, electronics, power plant, hydraulics or metal work, and to them falls the responsibility for maintaining the team's aircraft.

The pilots come from all over the United States—Kentucky, California, Texas, Illinois, and West Virginia. The youngest is 25, the oldest 31, and all but one are married ; four of them have children. They joined the Navy between 1940 and 1942 from different walks of civilian life : one was a journalist, some were students, another was a surveyor ; two are University graduates. Their hobbies vary just as much and range from goose-hunting and auto mechanics to golf, art, basketball and photography. All six saw war service on aircraft carriers in the Pacific Theatre ; one shot down 14 Japanese fighters and sank an aircraft carrier, another shot down five Japs. The new, fourth leader of the team is Lieutenant-Commander John J. Magda, who took over from Lt.-Cdr. R. E. "Dusty" Rhodes in January.

Only four aircraft are used at any one time during the "Blue Angel" demonstration, but six are flown to each show in case of minor damage or mechanical difficulty en route. The unit at present uses Grumman F9F "Panther" single-engine single-seaters, one of the Navy's newest carrier-based fighter types. This is the third aircraft model of Grumman Aircraft Engineering Corp. to be used by the team, the predecessors being the Grumman F8F "Bearcat" and the F6F "Hellcat."

Thirty consecutive minutes of precision aerobatics in a jet-propelled high-speed fighter is no picnic. Yet this is the routine performance of the "Blue Angels." The curtain raiser consists of four aircraft in close diamond formation shooting across the field at near-ground level at better than 500 miles an hour. As they approach the field again, the formation executes a formation barrel roll while releasing coloured water from the wing tip tanks. Just before take-off the eight tanks of the four machines are alternately filled with red, white and blue water which, when released, vaporizes and leaves coloured trails in a corkscrew pattern as the formation demonstrates the roll.

This manoeuvre is succeeded by a reverse one-half Cuban Eight, which in turn is followed by a regular one-half Cuban Eight and concluded with a reverse echelon roll. In this most breath-taking manoeuvre the four fighters pass over the field at tree top level in right echelon. As they approach the spectators they begin what appears to be a normal echelon barrel roll, but as the formation reaches the inverted position, each aircraft skids to the opposite side of the one directly ahead, and upon completing the roll-out the formation recovers on the opposite side in a left echelon.

At this moment a yellow Grumman F8F "Bearcat" piston-engined singel-seater fighter

With folded wings the six aircraft of the "Blue Angels" wait for the call to demonstrate their thirty-minute routine of Navy precision aerobatics at one of their many appearances throughout the U.S.A.

The "Blue Angels" even "walk" to their appointments in formation. Shown en route to a scheduled air show, the team finds an opportunity to practice close-formation flying for which they are famous.

appears on the scene, representing an "enemy." The four "Blue Angels" immediately assume offensive formation and make simulated gunnery runs on the "enemy." Four smoke canisters are concealed below the arrester hook of the "Bearcat," and after a series of furious passes by the "Blue Angels" the "enemy" is "shot down," trailing a long plume of smoke. To complete the illusion — and probably to show that in peacetime the four pilots really are "Angels" and wouldn't harm a fly—a forty-pound sand-weighted "pilot" equipped with a regulation twenty-four-foot parachute "bails out from the doomed 'Bearcat' " as it spirals down in "flames." Prior to his "escape without injury" the fake pilot is stowed away carefully in a special container beneath the aircraft. While he floats leisurely to earth, the real pilot continues his more or less vertical descent until he disappears behind trees or buildings.

After this "dramatic" episode, the "Blue Angels" assume an echelon formation for the remaining portion of the show, demonstrating the previous routine of barrel rolls, Cuban Eights and loops in tight military formation.

Since 1946 the team have been watched in every part of the country by over thirteen million spectators. They were formerly based at the U.S. Navy's Advanced Air Training Command at Jacksonville, Fla., and later moved with the Command to Corpus Christi, Texas. At present they are stationed at the Naval Air Training Command Headquarters at Pensacola, Fla.

Eight of the specially trained twelve-man jet maintenance crew which accompanies the "Blue Angels" at all times. The chief in charge of maintenance, ADC Barney Baxter, is on extreme right.

Here are the angelic features of the six pilots making up the official Flight Exhibition Team of the U.S. Navy. There is no doubt about their being at home in the skies—though one wonders whether they would feel equally comfortable in Heaven :

Chief "Angel" is Lieutenant-Commander John J. Magda, 31, who took over last January. He hails from Louisville, Kentucky, is a College graduate, married, has two children. During the war he shot down five Jap aircraft, was himself shot down and was missing in action for a week. His hobbies are golf and goose-hunting.

Only unmarried member of the team is Lieutenant (Junior Grade) Jack H. Robcke, of San Francisco, Calif. He is 28, joined the Navy in 1940, saw action on aircraft carriers in the Pacific and joined the "Blue Angels" in December 1948. Hobbies are sports and automobile mechanics.

A former journalist is Lieutenant Robert L. Longworth, who used to work on the paper of his home town, the "Bluefield Daily Telegraph," of Bluefield, West Virginia. He is 28, married, has one small son. He enlisted in 1941, helped to defeat and occupy the Japs, and joined the Team in April, 1949. His hobbies are sports and art.

Lieutenant (j. g.) Edward F. ("Fritz") Roth is 27 and joined the Navy in 1942. He comes from Palo Alto, Calif. He is married but has no children.

Lieutenant Arthur R. ("Hawk") Hawkins was a surveyor with a mapping company before he became a Navy regular. He is 26, has two sons. A Texan from a place with the improbable name of Lufkin, he enlisted in 1943 and became one of the Navy's top fighter aces. He sports about fifteen war medals (including three Navy Crosses, second-highest Navy award) and thus is the team's most decorated member. He sank a Jap aircraft carrier and a 7000-ton freighter and shot down 14 Jap aircraft. His chief hobby is relatively peaceful : basketball.

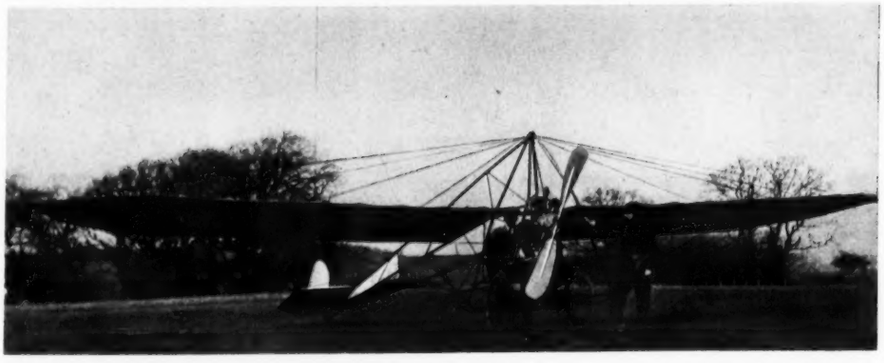
Youngest "Angel" is Lieutenant (j. g.) George W. Hoskins, 25, who hails from Danville, Illinois. He has two children, enlisted at the age of 18, served in the Pacific from April, 1945, a few months before the end of the war, until May 1948. A month later he joined the team. Hobbies are photography and automobile mechanics.

Denmark's Barnstorming Stringbag

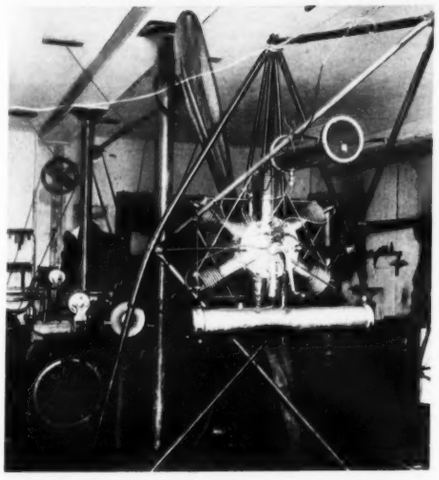
The early barnstorming heroes of the air used to say that a good pilot flies "by the seat of his pants." J. C. Ellehammer, the Danish pioneer aviator, aircraft constructor and inventor, applied the term in the most concrete manner in 1909 when he built his second 'plane, the "Standard," which was flown literally and uncompromisingly by the seat of the pilot's pants. Ailerons were manoeuvered by sliding sidewards, elevator by similar acrobatics backwards and forwards. This was made possible by connecting the pilot's seat to the control surfaces. Only the rudder was operated "conventionally," to wit, by an old bicycle handle bar. Irreverent Danish aviators had various off-colour names for the pilot's movements in flight...

Respect for the scarcity of textiles and leather in present day Denmark, coupled with the Danish civil-aviation authorities views on flying safety, led Mr. Sylvest Jensen, Air Circus owner, order conventional stick-and-bar controls to be built into a replica of the Ellehammer aircraft which started its trial flights at Copenhagen Airport in the middle of March.

The replica, faithfully duplicating the 1909 Standard, was built by Skandinavisk Aero Industri, of Copenhagen, manufacturers of the KZ ambulance and personal aircraft. Skandinavisk Aero Industri had one welder, one joiner, one fitter and one construction mechanic on the job. They started work in the autumn of 1949 and completed it in March 50. All stressed parts of the airframe, including the wings, are made of welded steel tubing and braced with wire.

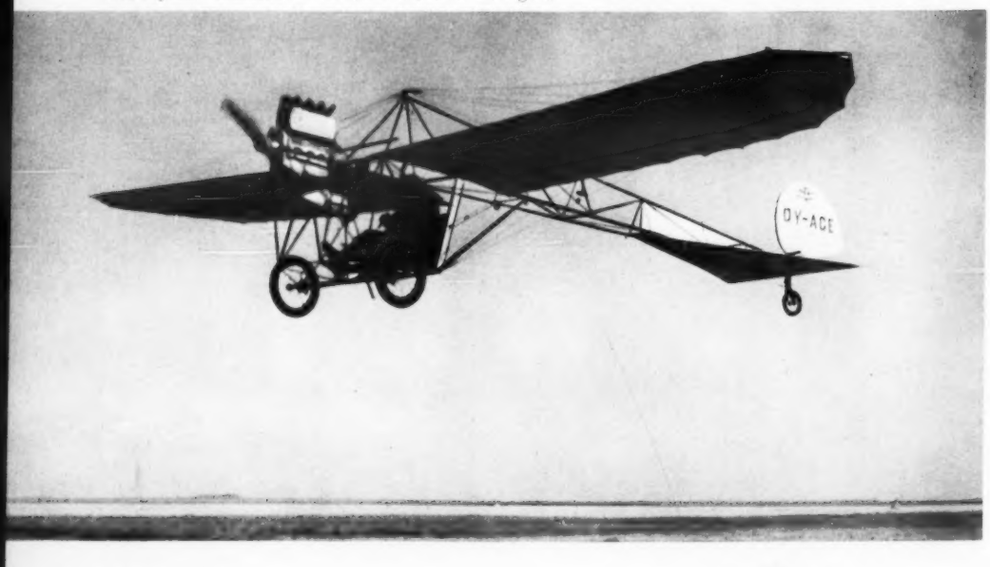


The original Ellehammer "Standard" of 1909-1910.



J. C. Ellehammer's workshop with the engine and propeller that drove the original "Standard."

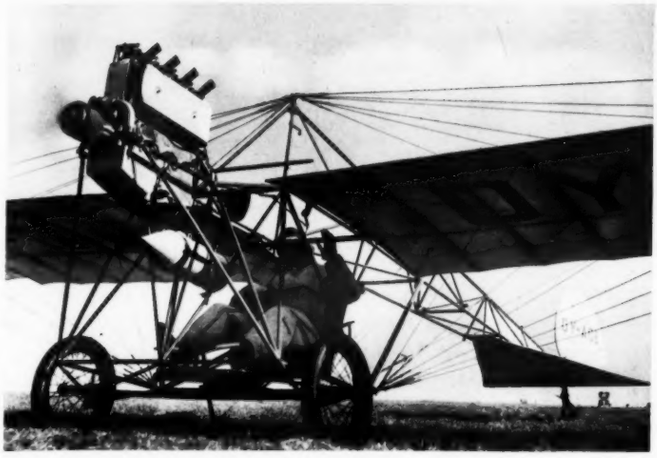
The replica, "Standard II." It has a Cirrus in-line engine.



The wings feature wooden ribs and are fabric-covered. The engine is a "Cirrus III" of 1922 with a maximum output of 80 H.P. Ellehammer's original engine was a six-cylinder radial he had built himself; it delivered a maximum of 60 H.P. at about 1150 r.p.m.

Instruments comprise an altimeter, a simple, wind vane-type airspeed indicator, tachymeter, oil pressure gauge, and spirit level. The pilot seat is a very healthy spot in the fresh air, without protection of any kind. The empty weight of the plane is 750 lbs. With 35 lbs. gasoline, 20 lbs. oil, and a pilot weight of 170 lbs., the gross weight becomes 975 lbs. Maximum air speed is in the vicinity of 55 m.p.h. The ordinary demonstration altitude will be about 650 ft.

The designer of the spidery replica is a civil engineer, Bjorn Andreasen. He certifies that apart from the slightly stronger engine, the control system and the instrument equipment, the plane is a true copy of J. C. Ellehammer's original "Standard," which was begun in 1909 and flew in 1910. At the first



Sylvest Jensen at the controls of the replica.

Contrast : A "Meteor" of the Danish Air Force takes off as the "synthetic" old-timer lands.

public demonstration at Copenhagen Airport, the daughter and son of Ellehammer were present. A Danish Air Force "Meteor" happened to take off just as Sylvest Jensen was landing. It was estimated that the "Meteor" taxied, took off and proceeded to a point some three miles away in the time it took the "Standard II" to eat up the 1,300 feet to the point where the "Meteor" had been standing on the runway.

The Ellehammer stringbag will join eight other aircraft and a troupe of pilots, mechanics and other personnel of Sylvest Jensen's barnstorming circus, the first air circus ever to operate in Denmark. Jensen hopes to start his shows early in the summer. For the time being his crowd is training with considerable enthusiasm. That this can be risky is shown by an incident at Vandel airfield, Jutland, early in April when one of the circus' KZ-III aeroplanes was practicing landings on a moving truck. The aircraft landed not *on* the truck, but just behind it and broke its propeller when it caught up with it.

Learning Airways Control by Film

BY C. G. GREY, LONDON

All authorities of all civilized nations agree that the most important factor in making a success of aviation—militant or civil—is Safety. In civil aviation comfort comes next, and after that are speed and regularity, about which one may argue. But Safety First should be the chief article of faith with all who control or influence aviation.

To the ordinary passenger safety probably means freedom from breakages in the air, or fire or forced landings. But in fact the real danger in flying is getting off the ground and getting back again. Few accidents happen to aircraft when fully airborne and on their way. And if something does go wrong, a good pilot and crew can generally put it right, or get down safely. As one of our most experienced air authorities has said : "The natural element of a ship is water, the natural element of the aeroplane is the air. Land is the danger to both." Or, as an Irishman put it : "It's not the fall that hurts, it's the bump at the end of it."

That is why for many years I have preached the need for aeroplanes "which will land slowly and will not burn up after a crack-up." But there are many more considerations than that. The unburnable aeroplane is still liable to damage passengers by impact—hitting the ground, running into obstacles, over-shooting or under-shooting its landing place and so forth. And preventing such accidents is a matter of getting the right aeroplane down, or up, at the right place in the right way at the right time. Which is much more a matter of ground

Inside the crew room of the airport the Captain, Radioman (with wavy stripes on sleeve) and the First Officer (or Co-pilot) receive instructions about starting out on their next trip. The aircraft bears the registration letters GMF and identifies itself on the radio telephone as "George Mike Fox" to answer correct transcription.

organization, and the proper training of ground-crews and ground controllers than of the people who fly.

Every pilot and navigator and radio man knows that there are certain places where the people in the air dare not trust a radio signal from the ground, for fear of letting down through cloud into a mountain, or into the sea, and where one dare not trust a weather report or a forecast. One very experienced navigator, who is also a ground controller, said to me that one may trust absolutely the uneducated but carefully trained native who is tapping out the signal on the keys, but one cannot trust the half-trained and partly-educated controller who is standing behind and telling him what signal to send.

In the cockpit : after take-off the Captain of GMF gives his position to Airport Control over the radio telephone.

Flying over scattered clouds, the crew of another aircraft, GVI ("George Victor Item"), listen to instructions from Airport Controller about coming in to land on Standard Beam Approach (S.B.A.).

At the Area Control, the Controller on duty listens to the meteorological reports before instructing aircraft in his area about their approach to one or other of the airports in his area.

Moreover, even when the technical training is sound, as such, it is useless, or even dangerous, unless its teachings are uniform with those of all other countries. If the signals sent out, or given on the ground, are understood by the air-crews of that country but are strange to the crews of visiting aircraft, the results must bring disaster.

I.C.A.O., the International Civil Aviation Organization, to which practically all nations which aspire to have a civil aviation belong, even if they do not always pay their subscriptions, sent out masses of rules and requirements about the ability of aeroplanes and engines to pass this, that and the other tests before they are certified as airworthy. I.C.A.O. also keeps "weather-ships" out in the Atlantic to give warnings of weather and to help the meteorologists to foretell what weather we may expect. And I.C.A.O. is very anxious to get all ground-controls at all aerodromes to conform to one uniform system of signalling from ground to air, and from air to ground, as well as signals given from Controls *on* the ground to aircraft *on* the ground, coming in, taking off, or just manoeuvring into position. I have known a pilot on a strange aerodrome to misunderstand a signal from a man on the ground just in front of him and swing round, with destructive effect to his own tail and to an aircraft standing nearby.

There is an old proverb in many languages, "The Best is the Enemy of the Good."—So true, such a lot of good things have been destroyed in choosing perfection. But, while searching steadily for perfection, the sound method is to make the best use of the good we have got for practical purposes now.

A first and most urgent and important step towards perfection on the ground is to train both air and ground crews to use the air-landing aids and navigational aids which are used internationally to-day. Another immediate problem is how to train them.

Fortunately the world is becoming more air-minded and film-minded at the same time, and an immense amount of teaching can be done with films. Such basic training would involve much time and trouble if it had to be done out of doors on the cold hard ground. A film-taught pupil does, at rate, grasp what he is at when he meets the problems and the instruments in practice.

With this idea behind it an instructional film has been made, encouraged by the highest Civil and Service Authorities, by means of which every country ought to be able to train its own control staffs on exactly the same lines, with a great saving in time and money, and with great benefit to safety in air transport.

This film is in six parts, each a separate phase of instruction in itself, so that instructors can run it through over and over again until the "class" thinks of the events shown as second nature. Furthermore, "film strips," as they are called in the movie trade, have been made of certain parts, so that they can be shown in a lantern and stopped and studied where needed, and used to check up on how much each pupil has absorbed of the lesson.

The visual instruction with the instructor's explanation in his own language should enable any air authority to staff its aerodromes with competent controllers who understand the international methods. And instructors should be able to weed out incompetent pupils at an early stage before they can do any damage in practical work.

The film, which is called "Airways" has been made by John Harvel (Productions) Ltd., of London, in close co-operation with the British Ministry of Civil Aviation, which has provided all the technical data and has passed the script for production.

Part I — Explains simply just what happens in controlling the "Take-off" of an aeroplane. And the importance of the work of I.C.A.O. in the interests of air safety is demonstrated. The efficiency of modern trained crews in the air, and of modern radio and radar used on the ground by trained professional staff are shown. This

Inside the Area Control Room : The Controller arranges handing over the distant control of the aircraft to the close control of the Airport staff.

Inside the Radio Room at Area Control. A message comes in that an aircraft is having slight trouble in feathering an airscrew. Instructions are given accordingly. Whatever the message, the expressions of the radio room staff stay unmoved.

Airport Control informs an incoming aircraft that the runway is clear for him.

section shows the preparation for the despatch of aircraft—runway inspection, take-off procedure, flight direction, the "stacking" system, the routine in the control tower, and the procedure of "handing over" from aerodrome control to area control.

Part II — Shows the responsibility of Area Control for aircraft inside its area. The departed aircraft develops engine-trouble. The Captain tells Area Control, which informs Rescue Co-ordination Centre, which is put on the alert. (At this stage the "Point of No Return" is explained by diagram, and the use of Radio Aids.) The engine trouble is cleared, "Rescue" stands down. The procedure of "Handing Over" from Area to Approach Control at destination is shown. (Here another aircraft is brought in, asking for Standard Beam Approach — S.B.A.)

Part III — Shows S.B.A. in use, in conjunction with Air Traffic Control Service. Pupils are shown the lay-out for S.B.A. — Main Beacon, Inner and Outer Markers, Zonal Division, Equi-signal Approach Sector, Twilight Zone, and the "dot" and "dash" areas, —all in animated diagrams. And last, the machine is shown landing.

Part IV — Demonstrates the Instrument Landing System (I.L.S.) developed in the U.S.A. and now recognized internationally. This is dealt with in detail, including the airborne apparatus. The Duty Controller (Controller on Duty) is heard talking with his assistant about the general traffic situation, and arranging for an aircraft which prefers to use I.L.S.—The Commentator describes the procedure and the instruments, and the aircraft is seen coming in to land.

Radio Range is also explained in detail in this section, demonstrating its use on long-distance flights with diagrams which are very clear and important.

Part V — This, a very important section, introduces Long Range Radar Advisory Service, or M.E.W. (which means Micro-wave Early Warning). This system, when further developed, ought to eliminate "stacking,"—which Air Transport will have to abolish when turbo-jet liners are in regular service.

The film shows the observation of the aircraft on the radar screen at the M.E.W. Control Centre, until it is handed over to Approach Control at its destination.—The point is that the M.E.W. system should enable the crew of the aircraft to get the E.T.A. (Estimated Time of Arrival) so accurately that stacking will be unnecessary.

Part VI — Goes back to the aircraft of *Part I* coming in by M.E.W. The Captain decides, as darkness is coming on, to land by G.C.A. (Ground Controlled Approach) or "talk down."

The Commentator describes the equipment now used at Civil airports, such as the Operations Trailer, with Generating Truck, the Search and Precision Radar Systems, with explanation of the Cathode Ray Plan Position Indicator, and the Elevation Meter, — all of which sound terrifying on paper, but are quite simple in operation when seen in action though very intricate in construction.

The last stage describes, and emphasizes the responsibilities of the Director, the "talk-down" Controller and the Elevation Tracker, and gives a short account of the intensive training of these specially skilled operators at the Ministry of Civil Aviation school at Hurn, near Bournemouth.

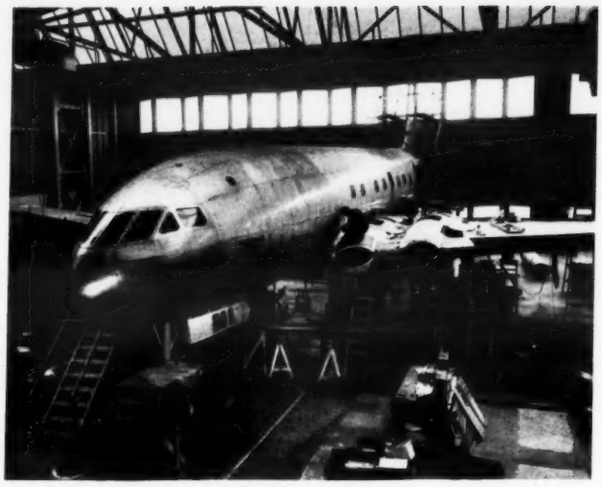
At the finish the landing of the aircraft under the direction of G.C.A. is shown in detail.

The equipment shown all through the film is that used on modern aerodromes, or airports. Thus the students of the film will have a useful basic training for a controller's duty in any other systems which may be installed at aerodromes abroad at present, or in time to come.

The method of distributing the film will be by sale of the copyright to each country which wants to develop its Civil Aviation on the right lines. And the price to each nation will be based on the "user," —that is to say the amount of use the country concerned is likely to make of it,—reckoning on the number of civil aerodromes and the known amount of air traffic.

These films are to be shown first in Montreal under the aegis of I.C.A.O.—perhaps one should say the High Patronage of I.C.A.O.—to the Council of the Organization and other distinguished official guests. This will be a "*Première*" of more than ordinary kinematic significance.

Five "Comets" in the assembly hall.



The second prototype is approaching completion.

The Comet's Tail

After 172 flights totalling 240 hours over the British Isles, the European Continent and as far as Tripolitania, the prototype of the de Havilland D.H. 106 "Comet" four-engined jet airliner left for Khartoum, in the Sudan, on April 24th to undergo tropical tests over a period of several weeks. It was also scheduled to make a side trip to Nairobi, just below the Equator at an altitude of 5,400 feet. To determine its ability to take off with a useful payload despite heat and altitude is regarded as the qualifying test of a British Empire airliner which must be suitable for operations also East of Calcutta, South of Nairobi.

The value of the prototype "Comet" for Britain's civil aviation would be negligible if it were not followed by a series of production aircraft trailing behind it like the tail of another kind of comet. In a paper read before the Royal Aeronautical Society, C. T. Wilkins, a leading collaborator of de Havilland Chief Designer Bishop, recently declared approximately the following : The prototype of an aircraft scheduled for production must never be so novel in design as to make its flight tests a prerequisite for the commencement of production. Otherwise the aircraft becomes obsolescent before it enters airline service, or its operational use is greatly delayed if all desired modifications are incorporated. At this important development stage even costly overtime work pays.

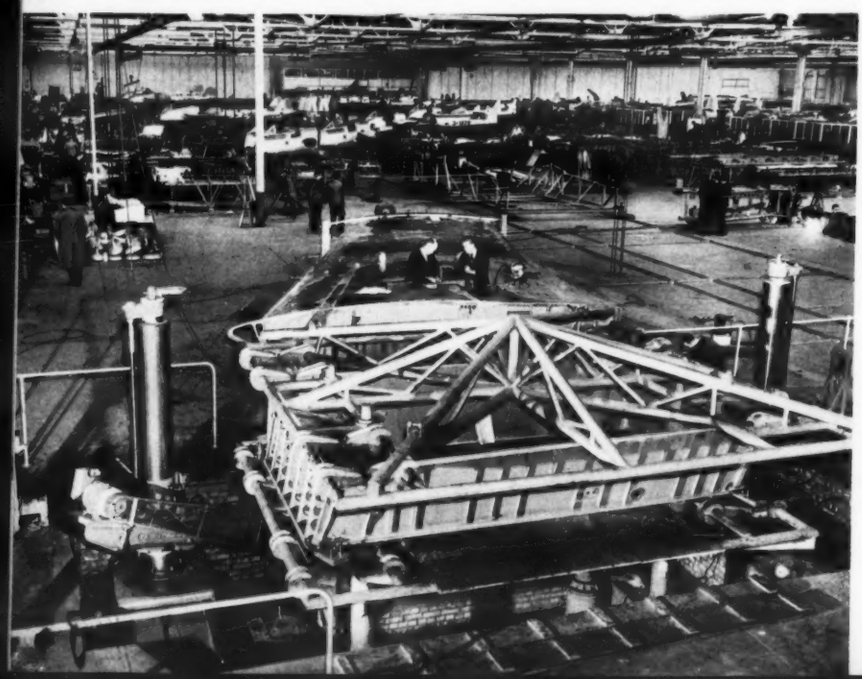
That these were not idle words is shown by the pictures on this page. Three quarters of a year after the prototype's maiden flight, at least five "Comet" fuselages are structurally complete in the assembly hall of The de Havilland Aircraft, Co., Ltd., at Hatfield ; two of them are already provided with wings and tail units. The first of these aircraft will be used as a second prototype for additional flight testing. The balance is intended for the British Overseas Airways Corporation, which has ordered a batch of 14 and hopes to start the world's first pure jet air transport services between London, Cairo and Karachi already before the end of 1951 and subsequently to extend the route to Australia. Two more "Comets" are to be delivered to Canadian Pacific Air Lines in 1952 or 1953 and will be used on the Vancouver—Alaska—Kuriles—Hong Kong—North Pacific service—the political situation permitting, of course.

Those who are interested in aeronautical engineering progress will welcome the energy de Havillands are showing—in their own business interests—in pushing the development of the new design which, although it is built by relatively conventional construction methods, nevertheless marks a very important advance in air transportation. The world is thus spared the painful spectacle of a protracted development period drawn out by eternal modifications. Those who regard the venture from an economic angle will not forget, on the other hand, that advances in the capacity and economy of means of production and transport are not welcome before the time when the previously available equipment has paid for itself and the capital investment has been more or less written off.

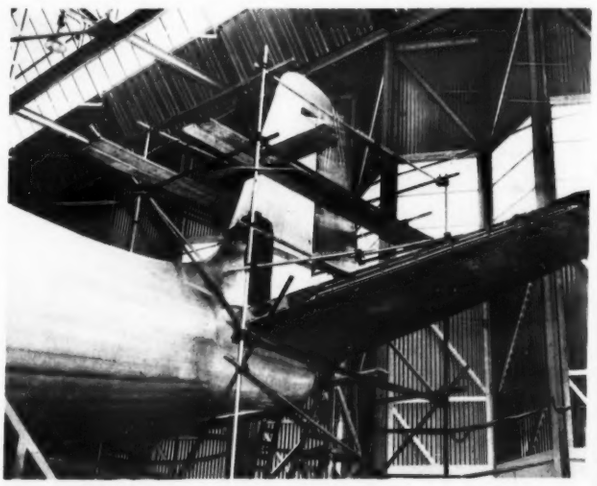
In normal times the two views are complementary. Each year produces its crop of technical advances and a limited demand for new equipment. In the ideal case each airline company alternately possesses the most obsolete and, after its replacement, the most modern flying equipment. However, the years in which we live are not quite normal. Almost simultaneously most of the leading airline companies purchased new aircraft of the first modern postwar types between 1946 and 1949. Extensive renewals of flying equipment will be due and financially bearable only in the years from 1954 to 1959. It is only then that engineering advances such as those heralded by the "Comet" will produce their full effect. And it will be even later that the undesirable, rise and drop in demand will gradually be evened out.

The "Comet" is an individual case, an indication of what will come later. An inadequately equipped airline, BOAC is being supplied with the latest transport equipment by a progressive manufacturer, de Havillands, as early as 1954. This may be the first break in the uniform up-and-down rhythm of the past few years. It also indicates the strength and weaknesses of British aviation.

Drilling jig for the wing center section. In the background "Vampire" fighters for Switzerland and "Venom" fighters are in production.



Assembly of the tail unit.



What's in the Air *

SERVICE AVIATION

The shooting down of an American naval patrol aircraft over the Baltic by Soviet fighters on April 8th, 1950, is still unexplained at this writing—and probably will remain so. As was to be expected, both parties insist on the accuracy of their versions of the affair. The Americans state that the machine was an unarmed Consolidated Vultee "Privateer" which was attacked over the open sea without valid reason, the Russians claim that it was a Boeing B-29 "Superfortress" which had flown 15 miles into Russian territory and manoeuvre areas and had opened fire on the Soviet fighters. However regretable the loss of the ten members of the American aircraft is, however irritated the tone of the diplomatic notes exchanged between the two countries may become, it is unlikely that the incident will have more serious consequences. Just like the continuous accusations and suspicions of espionage on both sides ; the demands for the recall of diplomats ; the exchange of impolite notes following the escape of a number of Czech pilots to the American zone of Germany, also this example of friction seems to be a relatively harmless advance skirmish of symptomatic rather than practical importance. What goes on behind these occurences is far more serious. So serious, in fact, that the Armed Services Committee of the U.S. House of Representatives at the end of March approved a military construction programme involving $689,058,181, including $100,000,000 for the reinforcement and expansion of Army and Air Force bases in Alaska alone. The U.S.A.F., to which $257,975,055 would be allocated, had warned the Committee that with its present facilities in Alaska it could not mount a strategic attack of any size or duration.

For the aircraft procurement programme of the U.S.A.F. and the Navy, Representative Carl Vinson, Chairman of the Armed Services Committee, recommends additional allocations under the 1950-1951 Budget in the amount of $583,289,221. The U.S.A.F. would get $200,000,000 to purchase 77 new aircraft, rehabilitate 228 machines for flying training and modernize 71 Boeing B-29 "Superfortress" bombers as tankers for in-flight refuelling. The $383,289,221 for the Navy would be used for the procurement of 379 fighters, 123 attack aircraft and 19 patrol machines.

POLITICS AND AIR TRANSPORTATION

In international civil aviation politics a major place was occupied by the rearguard actions fought by the European nations in the Orient. On March 31st, 1950, the Indonesian Government and KLM Royal Dutch Airlines formally established *Garuda Indonesian Airways*. For a duration of ten years the capitalization of the new Indonesian flag carrier will be held on a 50-50 basis by the contracting partners. Later on the Indonesian Republic will be entitled gradually to purchase the majority of the capital. KLM's major contractual obligation will be the efficient management of the company and the training of Indonesian operating personnel. Garuda Indonesian Airways will have a virtual 30-year monopoly as the Indonesian domestic air carrier and will be designated by the government as the chosen instrument operator of services to neighbouring countries.

Similar negotiations between the Viethamese and the French governments aim at the formation of an airline to be called *Air Viet-Nam*, with headquarters in Saigon. The government of Viet-Nam would subscribe 40 or 50 per cent of the capitalization, whereas the balance would be split up between Air France, Société Indochinoise de Transport Aérien (SITA) and certain other Indo-China interests.

Efforts are being made to reestablish a *civil airline system also in Japan*. At the end of March it was reported that Northwest Airlines, one of the major U.S. carriers, had proposed to the Allied occupational authorities to establish a domestic airline operating company in Japan. The Northwest scheme would involve a one-third participation by Northwest, one-third by Pan American World Airways and one-third by other airlines serving Japan and Japanese interests. Independently of this proposal, the Association of Japanese Industrialists and Financiers early in April addressed a petition to General MacArthur, Allied Military Governor of Japan, calling for "the complete abolition of economical control measures and restrictions imposed on industry and the Merchant Navy, and for authorization for Japan to resume commercial aviation activities." The American press described the petition as "the most audacious demand yet formulated by the Japanese."

On the other side of the globe official discussions are surprisingly concerned less with the sovereignty of the German air space than with the *sovereignty of the air over the Saar*. In accordance with the Franco-Saar Treaty, the Saar government is preparing a Civil Aviation Bill which is designed to regulate questions of air sovereignty, civil aviation policy, air transportation, etc.

*

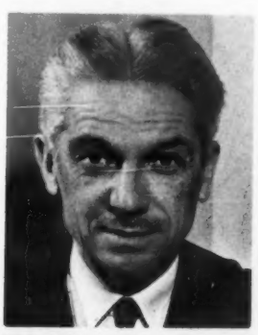
While Western Europe is beating an orderly retreat in the East, the Russians are advancing rapidly. On March 27th Moscow announced the formation of a *Sino-Russian airline* which initially will operate three routes between Peking and the Soviet Central Asian cities of Chita, Irkutsk and Alma Ata. The ten-year agreement stipulates that a Chinese national will be elected chairman of the company's board for the first two years, with a Russian as vice-chairman ; the director-general will be a Soviet citizen, his assistant a Chinese ; every two years, the top executives will be switched around, with a Soviet representative taking over the post formerly held by the representative of the Peoples Republic of China, and vice versa. At the same time Soviet Foreign Minister Andrei Vyshinsky and Chinese Ambassador in Moscow Wang Chi-Lsiang signed an agreement for the formation of a joint company to exploit the petroleum deposits in Sinkiang Province in Western China.

INDUSTRY AND AIR TRANSPORTATION

Of considerable interest is a recent decision of the U.S. Civil Aeronautics Board authorizing an investment syndicate headed by Laurance S. Rockefeller to purchase 85% of the capital of Marquardt Aircraft Co., of California, from General Tire & Rubber Co. Marquardt has been developing a series of ramjet engines. Rockefeller already holds considerable interests in a number of airline operators and aircraft companies. He owns 60,000 shares of Eastern Air Lines stock and is a director of the company ; he also has important holdings in McDonnell Aircraft Corp., Reaction Motors Inc. and Piasecki Helicopter Corp., not to mention other interests indirectly connected with aviation. The Civil Aeronautics Board has always been very reluctant to permit simultaneous holdings in the aircraft and airline industries.

Incidentally, the acquisition of *helicopter manufacturing stocks* does not seem to be a bad investment. At the end of 1949 *Piasecki Helicopter Corp.* had unfilled orders of $10,200,000, compared with only $4,749,292 at the end of 1948. This backlog begins to approach figures reported by large aircraft companies (Douglas Aircraft : $71,655,000). The helicopter seems to be making progress all along the line. After six months of trial operations in the carriage of mail, British European Airways is now using helicopters for passenger services on the Liverpool—Cardiff route. Eight weeks of experiments with Sikorsky Helicopters have persuaded the Belgian Post Office Department and the Sabena airline to inaugurate helicopter mail operations. On June 10th Sabena will open services on the Brussels—

Changing of the guards in the USAF : on April 4th President Truman appointed *Thomas K. Finletter* (left) as Secretary of the U.S. Air Force Department. As the chairman of the so-called "Finletter Committee" he advocated the adoption of a "70-Group Programme" for the USAF in 1947. Today's procurement needs of the USAF are bound to meet with the new Secretary's full understanding. The outgoing Secretary of the Air Force, *W. Stuart Symington* (right), has assumed the Chairmanship of the important National Security Resources Board.



Dr. Albert Roper, Secretary General of the International Civil Aviation Organization, early in April announced his resignation for 1951. Dr. Roper has served international commercial flying for over thirty years. In 1919 he acted as the Secretary to the Aviation Commission of the Paris Peace Conference and subsequently held office as Secretary General of ICAN for 25 years.

(*) Based on reports published in INTERAVIA AIR LETTER, daily international aviation news digest appearing in English and French.

Convair XB-36, equipped with caterpillar landing gear, making its first flight.

Jemelles — Liège — Lanaecken — Hasselt — Beringen — Turnhout — Hatenthals — Antwerp — Brussels circular route. The U.S. Civil Aeronautics Administration has authorized Los Angeles Airways to use its helicopters also under blind flying conditions. And the Armed Services Committee of the U.S. House of Representatives has recommended the allocation of additional funds for the purchase of military helicopters.

There is no doubt, the helicopter is becoming "respectable."

So far as the future of air transportation is concerned, a *prophesy* deposited at the beginning of April in the building of the Mutual Life Insurance Co., of New York, by Captain Edward Vernon Rickenbacker, President of Eastern Air Lines and well-known as an extremely sober businessman, may throw a light on things to come. In the year 2000, he stated, mail and freight will be carried by remote-controlled rocket aircraft, passengers will travel at speeds of 1,000 miles an hour, and helicopters will belong to the every-day street scene.

AIRCRAFT THAT "GROW"...

A month ago we reported that the U.S. Air Force had decided not to place a production order for the Boeing B-52 giant jet bomber. The duties of an aircraft of this class are to be assigned to the Consolidated Vultee B-36 also after 1955, and it seems normal, therefore, that the development of the type is being pushed. There was no lack in April of indications on how improvements to the B-36 are being planned or incorporated experimentally.

To begin with, all B-36B bombers now available will successively be flown back to the Convair plant in San Diego, California, to be fitted with four General Electric J-47 jet engines in pods under the outer wing panels, in other words, they are being converted into B-36Ds. The result will be an increase in the short-period maximum speed to about 435 m.p.h. Total conversion cost is $105,000,000.

Second, a B-36D is experimentally being fitted with yet another lot of four jet engines of the same type. This B-36, with six reciprocating and eight gas-turbine engines, will therefore have a total power of about 60,000 H.P. at its disposal.

Third, the caterpillar-equipped B-36 shown in our last issue accomplished its first flight on March 29th.

Fourth, the U.S. Air Force reports that it has taken delivery of the first RB-36, the long-range reconnaissance-bomber version of the same basic type.

Fifth, the U.S.A.F. has confirmed that it envisages a development of the B-36 which will have swept outer wings and will be driven by a secret type of airscrew designed for supersonic blade-tip speeds.

Sixth, in view of the failure some time ago of experiments with the stowage of a specially developed miniature jet fighter in the bomb bay of the B-36, an attempt is now to be made to carry one normal Republic F-84 "Thunderjet" fighter under each outer wing panel.

Seventh, a B-36 to be tested later this summer will have six double rocket-launching ramps in place of the normal eight rotating gun turrets with two twenty-millimeter cannon each.

This list omits any mention of the conceivable equipment of the B-36 bomber with propeller turbine engines of various models now undergoing development...

THE PROPELLER TURBINE ENGINE

Gas turbine-driven airscrews at present are one of the subjects preoccupying American aviation circles to a considerable extent.

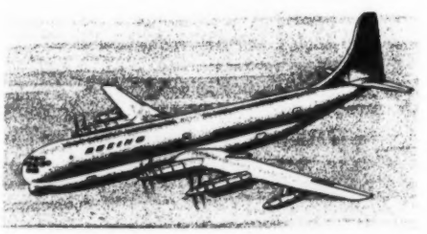
The Convair XP5Y-1 giant flying-boat of the U.S. Navy, which is powered with four pairs of Allison T-40 turbines, at long last made its initial flight on April 18th; delays in the completion of engine tests had drawn out the start of flying trials by several months. Douglas and Boeing have completed the elaboration of projects for the equipment of their large transport types, the Douglas C-74 and YC-124A "Globemaster" and the Boeing C-97 "Stratofreighter," with four propeller turbines each, probably also Allison T-40s of about 5,500 H.P. The projects have been submitted to the U.S.A.F. and promise increased cruising speed, payload and range.

A lively discussion also surrounds the use of the gas turbine in commercial transport aircraft. Apart from the twin-engined Convair "Turboliner," a new version of the Douglas DC-6 with four single Allison T-38 turbines seems to be closest to realization. W. A. Patterson, President of United Air Lines, recently stated that he would welcome the possibility of placing such an aircraft into cargo operations in about a year-and-a-half. Donald W. Douglas, the aircraft maker, announced that the cruising speed of the DC-6 will be increased from 300 m.p.h. to 380 m.p.h. by such a conversion and that the direct operating costs per passenger-mile would be cut by about 30%. A prerequisite would be the availability of "an acceptable turbine at an acceptable price," which is not the case at the present time.

Somewhat more sceptical but not opposed to the propeller turbine is the Lockheed Aircraft Corp. Its installation in the "Constellation" would be "no trick" and would increase the aircraft's life by some five years, according to Lockheed Chief Engineer Hall L. Hibbard.

Finally, Glenn L. Martin Co. has announced that its new Model 4-0-4 medium transport is designed to take propeller turbines in the place of reciprocating engines.

Not very long ago the propeller turbine was considered by American experts as useless interim solution between the piston engine and the pure jet. The fact that this view has meanwhile been revised is probably due to two reasons: first of all, the cost of developing a pure jet transport aircraft is extremely high, with estimates ranging from $20 to $60 million; secondly, it seems that certain types of so-called "Compound" engines with high-performance turbine superchargers and utilization of the exhaust gases for the generation of additional thrust, which at one time were expected to result in a considerable improvement in performance at high altitudes and in superior economy of the piston engine, are not yet to go into day-to-day operation.



Boeing C-97 "Stratofreighter" military transport with four Allison T-40 propeller turbines.

COMMERCIAL TRANSPORTS OF THE FUTURE—ON PAPER

American aircraft manufacturers, headed by Lockheed and Boeing, continue to hold the opinion that the propeller turbine airliner will have to give way to the pure jet transport at some future date. Boeing has published "artists' conceptions" of a number of project studies of such pure-jet airliners. In the shape of their wings and empennages, as well as in the installation of their power plants, these projects strongly resemble the Boeing B-47 "Stratojet" swept-wing bomber. The long-range transport project features a double-deck fuselage like the "Stratocruiser" and six power units, whereas other projects comprise four engines and, if necessary, auxiliary fuel tanks under the wings.

Other studies concerning future commercial airliners have been published by Alexander Kartveli, the American designer, and Louis Bréguet, the veteran French aircraft manufacturer. For this purpose, Kartveli pulled out the designs of the Republic "Rainbow" airliner, which was only built in two military prototypes some years ago, and Bréguet derived the design of his Model 97 "Fulgur" from the Bréguet 761 cargo type—evidently after subjecting the latter's fuselage to a thorough aerodynamic "cleaning-up." Both in the American and in the French projects different types of propeller turbine and jet pure engine are envisaged, depending upon the proposed operational use of the aircraft.

Three Boeing projects for jet-propelled transport aircraft: Top to bottom: four-engined high-wing monoplane with auxiliary fuel tanks; four-engined low-wing monoplane; six engined long-range airliner with double-decker fuselage.

...AND IN REALITY

Following the installation of its definite power plant (Pratt & Whitney R-4360-B13 engines of 3,500 H.P.), the French SE 2010 "Armagnac" has resumed its flyings trials. Seven more machines of the type are on the final assembly line, and more than ever it is expected that the maximum gross weight will be increased to a point considerably in excess of the original 161,000 pounds.

At the time of going to press it is learned that the Lockheed Aircraft Corp. has received a contract from Eastern Air Lines, whose rational working methods are proverbial, for ten aircraft of a new version of the proven "Constellation." Designated as the "Constellation L-1049," the aircraft are to be delivered in July 1951 and differ from the present "Constellation L-749" particularly in their lengthened fuselage (by 18 feet) which will accommodate 92 passengers. For high-density coach services it will even be possible to carry 110 passengers. The aircraft will be structurally designed to operate at a 400 m.p.h. cruising speed and will therefore need not be reinforced if the piston engines now envisaged for the aircraft would be replaced with propeller turbines of greater power. There are such things as "transport aircraft that grow."

Bréguet 973 project for a 49-ton commercial transport for 100 passengers; propeller turbine power plant.

The First Turbine Airliner

Vickers Armstrongs "Viscount 700"

By James Hay Stevens, London

The prototype V. C. 2 "Viscount" during the landing approach with double slotted landing flaps in the down position. The flaps can be lowered only after throttling the engines.

Behind the design of the Vickers-Armstrongs "Viscount" lie many thousands of flying hours' experience on other types that have led directly to its development. The first part of the background came with the wartime design of the high-altitude "Wellington VI", with its pressurized crew compartment in the nose. Then, at the end of the war, the "Viking" airliner was designed (originally using as many "Wellington" parts as possible, but later almost entirely re-designed), specifically as a temporary measure pending the development of a true postwar civil type. As a stopgap the "Viking" has proved an excellent aeroplane, being the only postwar, medium-sized European airliner to go into regular service (the Languedoc is *not* a postwar aeroplane), and it has provided invaluable experience for George R. Edwards and his design team. Undoubtedly, both the virtues and the vices that have appeared during the "Viking's" service have contributed largely to the piloting, maintenance and accomodation features in the "Viscount". Research aeroplanes that have contributed even more directly were the "Nene-Viking" and the "Dart-Wellington", both of which served to provide experience of turbine engines and also to confirm theories of their operational advantages.

The fundamental belief of George Edwards in the turbine engine lies, firstly, in the safety of its fuel and, secondly, in its lack of vibration. Although in the U. S. A. there is a tendency to use volatile fuel in turbine engines, mainly because it is more generally available, this is a most retrograde policy—particularly where civil airliners are concerned. The reduction in fire risk due to the use of kerosene has been amply demonstrated in the last few years by the comparative rarity of fires after jet fighter crashes. Even when fires have occurred, they have been very mild in comparison with the explosive conflagrations to which one is accustomed. The smoothness of the turbine engine, without any of the vibrationary cycles of the reciprocating engine, is not only more pleasant for the passenger but also considerably reduces airframe maintenance.

The decision to go straight ahead with a propeller-turbine airliner required great foresight and courage at a time when even the prototype Rolls-Royce "Dart" engine had not been run and when the ex-tempore Rolls-Royce "Trent" (a converted "Dervent") had proved almost impossible to regulate. This decision was also contrary to the well-proved precept that to combine a prototype engine with a prototype airframe doubles the chances of the failure of *each*. Compensating, to some extent, for this double risk was the decision to base the structural design on the wel-tried structure of the "Viking", itself of conventional practice. As he has explained in public,[1] the designer also bases his faith on the centrifugal compressor, rather than the axial, turbine engine because of its greater resistance to impeller damage from grit and ice and because of the greater ease with which ice formation can be prevented.

It is too early to say whether the faith in the propeller turbine was completely justified—only actual airline operation over a period can provide the final answer. The history, however, of the "Viscount" prototype trials and the generally rapid, trouble-free development of the Rolls-Royce "Dart" engine suggest that only some large and unforeseen trouble could prevent complete success. Nevertheless, it is a sad but true fact, proved many times, that however successful an aeroplane may be during its trials, actual service operations will often reveal faults that are so serious as to delay regular use severely—the "Constellation", "Viking", Douglas DC-6 and "Stratocruiser" all met such troubles in their early airline life. If the "Viscount" does fulfil its fine promise—and it will not be for lack of care in design and vigour of testing if it does not—it will put Great Britain three years ahead in medium airliner design.

The "Viscount" prototype, the V. C., was designed to fulfil a Ministry of Supply Specification, 8/46. The first flight was made on July 18th, 1948, and by September of the same year it gave an outstanding display of smooth flying in the hands of the firm's chief test pilot, "Mutt" Summers, at the S. B. A. C. Display. As a result of the success of intensive flight trials and an increase in the "Dart's" shaft horsepower from 1,000 to 1,400 within a year, it was decided that the production version, the Type 700, should be larger. The original 32-passenger cabin was lengthened by 6 ft. 8 in. (2.03 m.) to allow new alternative

[1] "Turbine-Engined Transport Aircraft", a paper presented before the joint Anglo-American Conference of the Institute of the Aeronautical Sciences and the Royal Aeronautical Society, New-York, 24 May 1949.

Slim engine nacelles and a slender empennage (elevator unit with pronounced upward dihedral) are characteristic features of the "Viscount". Doors and windows are elliptical in shape.

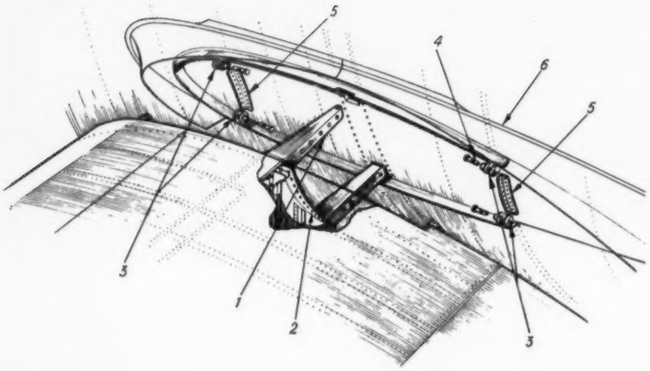

1. Main spar
2. Spar shear cleat
3. Auxiliary spar attachment points
4. Joint pin
5. Auxiliary spar shear cleats
6. Wing root fillet

Fig. 4 : Wing root to fuselage joint.

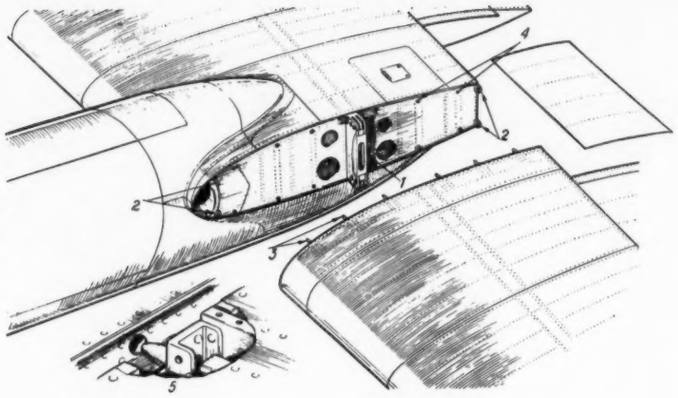


Fig. 5 : Joint between inner and outer planes.

accommodation for 40 or 53 seats, while at the same time the wing area was increased by an addition of 5 ft. (1.52 m.) to the span catering for a change in normal all-up weight from 41,000 lb. to 50,000 lb.

The low-wing layout adopted is probably the simplest form for an airliner, although it lacks the aerodynamic symmetry of the mid-wing layout, or the exceptional passenger's view of the high wing. In the "Viscount" the fuselage line is continuous from nose to tail, the under surface of the wing merging into the belly of the fuselage. The wing plan has the characteristic taper of the Vickers types ("Wellington" and "Viking") with squared tips and an aspect ratio of 9.17 : 1. The wing section used is a modified NACA 63, with a thickness of 15.5 percent at the root, tapering to 13 percent at the tips. The ailerons are of rather high aspect ratio with Westland-Irving type sealed pressure balances. Double-slotted flaps, the first to be fitted to a British aeroplane, are used with an internal extension mechanism (Fig. 1).

The fuselage over the cabin portion is of true parallel cylindrical form, rounding off at nose and tail, but generally remaining almost circular in section. The cockpit enclosure is built up from the main fuselage. Generally, the fuselage gives the impression of having been laid out in the first place to be the best shape for passengers and freight, the aerodynamic form, pleasing though it is, being a secondary consideration.

The tail unit is conventional in layout, though of rather higher aspect ratio than those of most airliners. Excluding the small dorsal fin the vertical surfaces have a thickness ratio of 14 percent. The dihedral tailplane and elevators have the same thickness at the root, tapering to 12 percent at the tip. The tail controls have inset hinges, giving large balance areas, without shrouds on the fixed surfaces (Fig. 2).

The small diameter of the engines results in pencil-like nacelles that are long enough to ensure that the slipstreams do not cause vibration through interference with the wing air flow. The tops of the nacelles merge into the wing surface at the maximum camber, while the lower part is slightly underslung.

Structural Features

As already mentioned, there is little unusual in the "Viscount's" structure, the design being straightforward and practical, following closely that of the "Viking". All components are metal-skinned, the material throughout being Alclad or Duralumin sheet to D. T. D. Specifications 646, 546, 610 or 390. On the skin plating countersunk rivets are used down to 18 s. w. g. (0.048 in.), dimpling being used on thinner gauges. Mushroom-headed rivets are only used at seam joints and along boundaries of openings in the pressure cabin. Skin joints are made with butt straps, lapping being avoided because of its poor finish.

Some details of the wing are shown in Figs. 3-5. Each half is made in three sections; an inner portion attached to the fuselage and carrying the nacelles, a readily removable outer plane and a detachable wing tip. There is a built-up main spar at 40 percent chord, with light front and rear spars at 5 and 70 percent, respectively. The wing skin is put on in sheets running round from the lower boom of the front spar to the top of the rear spar, so giving a clean leading edge. The bottom skin sheets, between the lower booms of the front and rear spars, are almost flat. There are comparatively few ribs, and the skin between them is stiffened by closely-spaced chordwise channel members. The leading edge is double-skinned to provide the air space for thermal de-icing, the space between the leading-edge skin and the front spar forming the main hot air delivery duct. The inner plane is attached to the fuselage by twelve bolts through the solid booms of the main spar (Fig. 4), by pairs of bolts through the front and rear spar booms and by bolted "shear cleats"—angle plates that carry the spar web loads into the fuselage skin. The root fillets are riveted to wing and fuselage, and the rivets may be drilled out for oversize ones on re-assembly, since inner-plane changing is really a minor repair operation. The outer-plane attachment is much simpler (Fig. 5), with bolted fittings on each spar boom and twelve spigots to transmit skin loads.

The ailerons are made in two sections to avoid hinge friction due to deflexion. Light-alloy covered, they have channel spars and ribs, and steel plates on the leading edges for mass balancing.

The double-slotted flaps are made in three portions on each side. They are built up with H-section spars and top-hat ribs. Because of the thin section at the trailing edge Redux bonding is used to some extent in place of rivets. The end ribs of each portion of the flaps are castings which extend forward to carry the slats and also to hold the operating mechanism. The flaps are electrically operated by a motor in the fuselage that drives two torque tubes running outboard along the rear spar for the full span of the flaps. At the end of each flap section there is a sprocket on the torque tube that drives an endless chain round an idler sprocket mounted on a bracket attached to the wing (Fig. 6). A slide, attached to the flap and the chain, moves in a guide channel when the torque tube is rotated and gives the rearward motion, the angular (downward) deflexion

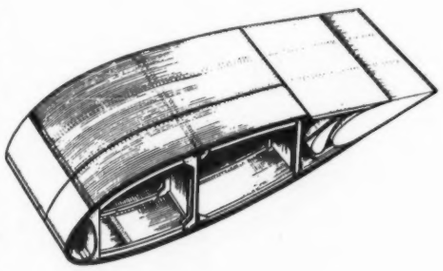


Fig. 3 : Typical wing structure details, showing main spar, auxiliary spars and retracted landing flap. The double-wall leading edge contains the de-icing duct.

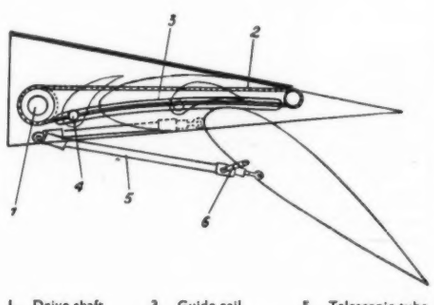


Fig. 6 : Diagram of flap operating mechanism. The locking lever (6) comes into action only when the flap is fully down to relieve the load on the chain mechanism.

Fig. 7 : Prototype cockpit with the seats removed. The small half-wheels at each side of the cockpit are for the nose wheel steering.

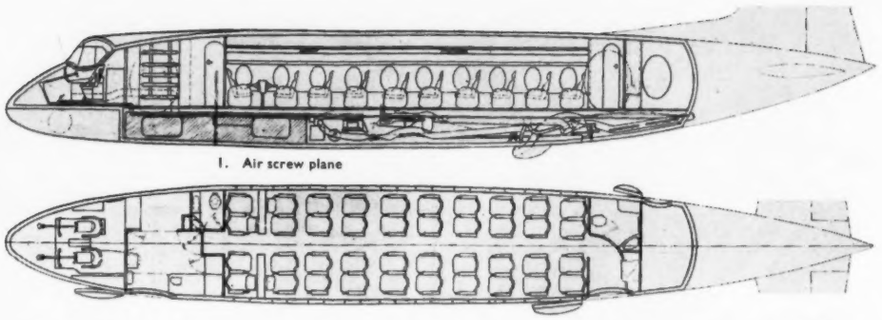
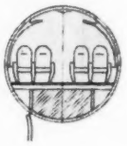


Fig. 8 : Fuselage accommodation of the "Viscount 702" for 40 passengers. The whole volume is pressurized except the extreme tail and the nose wheel bay. Below the floor are the ducts for the pressurizing system and for the tail unit de-icing, together with the cooler air scoop. The shaded area si the forward baggage or freight space, with further holds at the front and rear of the cabin. There is a toilet at both the front and rear of the cabin.



of the flap being controlled by a telescopic strut. There is manual operation from beneath the cabin floor in the event of an electrical breakdown. An interesting arrangement is that there is a mechanical connection between flap and throttle levers, so that the flaps cannot be lowered until all four throttles are one-third closed, and if a throttle is opened with the flaps down, they are automatically returned to the best climb-away setting.

All flying control runs are systems of push-pull tubes and levers with spherical and roller guides. Wherever these, or any other, controls pass through the pressure-cabin skin, movement is converted by torque tubes to rotary motion, thereby improving the sealing maintenance problems. No temperature compensation in the control runs is needed because the material is similar to that of the main structure. The controls are locked by spigots at the surfaces operated by tie-rod and chain systems from a control in the cockpit. The cockpit lever is interconnected with the throttles so that, although they may be opened sufficiently for taxiing, they cannot be opened for take-off until the locks have been withdrawn.

The tail unit structure is conventional enough and is fitted with thermal de-icing ducts in the leading edge.

The tricycle undercarriage consists of three forward-retracting oleo-pneumatic struts, each carrying a pair of twin wheels. The main wheel legs are braced by a drag strut and, although the nose wheel leg is a cantilever unit, they are generally similar in design and action.

A novel feature of the "Viscount" is the duplicated brake system. Because of the nose-wheel steering and the low swinging propensities of the type, differential braking is regarded as an emergency operation, and the main system consists of full braking of both main wheels simultaneously from grips on the control wheels. However, when the small wheels for the steering are being used (Fig. 7), this would be inconvenient and toe pedal brakes are used instead. Each system is independent, even including duplicated hydraulic brake disk-operating units in each wheel.

The fuselage construction is of classic stressed-skin design, with relatively closely-spaced open frames and stringers, covered by a flush-riveted alclad skin. The whole is pressurized, save for the extreme tail and the nose-wheel bay (Fig. 8). The excellent "Viking" policy of large windows, each forming a "pull-in" emergency exit, has been retained. This does much to make the "Viscount's" cabin more spacious and lighter than most modern airliners—it is, in fact, reminiscent of that excellent old aeroplane, the Handley Page 42 "Hannibal". Cabin doors, too, are large, the front one being 5 ft. 2 in. by 4 ft. 7 in. and the rear 5 ft. 6 in. by 4 ft. 7 in. The windows and the larger doors are elliptical, since this is the best stress-resistant shape for an opening in a cylindrical shell. Each window has double Perspex panels as a precaution against blow-out, the air space between them being dried by a silica-gel container. All doors have double-locking catches that ensure correct closing and prevent opening until the cabin pressure has been released.

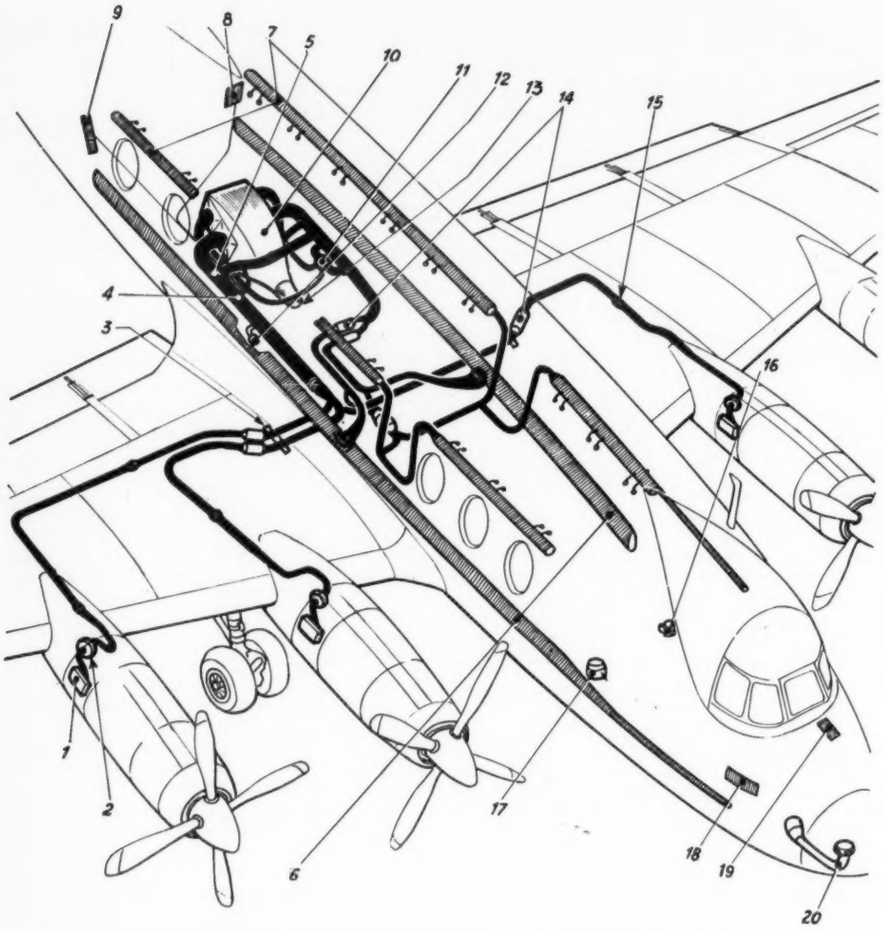
Passenger Amenities

The seating plan shown in Fig. 8 is that for the British West Indian Airways version which, except for the crew, is similar to the British European Airways variant, but several others have also been suggested. The first Vickers version, shown in the photographs (Figs. 9 and 10), included a division of the cabin into two saloons, as in the "Viking". In the prototype this layout was used and the furnishing of brown and cream has the same warm, pleasant atmosphere that I, personally, like in the "Viking". In the production version the seats will have adjustable backs. The large amount of space available for baggage and freight—that very profitable part of an airline's business—is worth noting, as is the fact that it is all within the pressurized volume.

The pressurization and air conditioning system is shown in Fig. 11, which gives a good idea of the location of all items. The maximum pressure differential is 6½ lb/sq. in., which gives a cabin atmosphere of 8,000 ft. at a true height of 30,000 ft., and this can be maintained by any one of the three

Fig. 9 : Prototype cabin interior. The similarity to the "Viking" furnishing is noticeable. The large windows are striking.

Fig. 10 : The prototype rear cabin, with open entrance door. The eight front seats are arranged to face with a table between them.

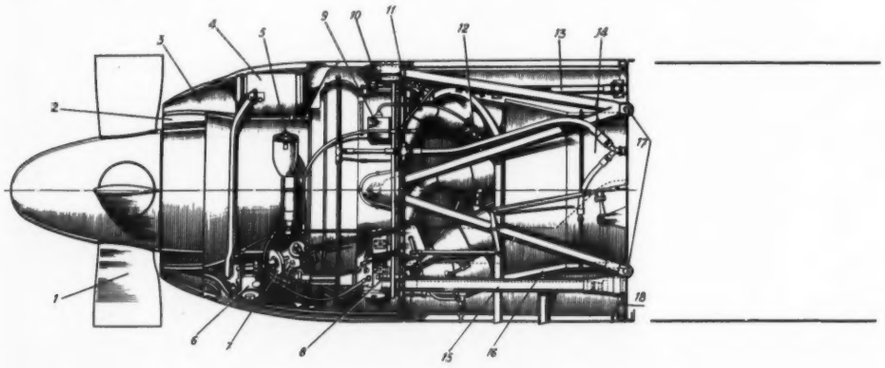


1. Filter
2. Compressors
3. Spill valves
4. Pressure relief valve
5. By-pass valve
6. Lower ducts
7. Upper ducts fitted with louvres
8. Temperature control panel
9. Thermostat control
10. Cooler
11. Turbo-expander
12. Mass flow control
13. Cold air scoop
14. Silencers
15. Expanding joints
16. Safety valve
17. Discharge valve
18. Switch panel
19. Pressure controller
20. Inward relief and test valve

Fig. 11 : General layout of the pressurizing and air conditioning ducts and equipment. The inward relief valve (20) is a precaution against the cabin pressure becoming less than that of the atmosphere.

Fig. 12 : One of the interchangeable "Dart" power units, showing the disposition of the equipment and accessories (Arabic figures) and division into bays (Roman figures).

1. Four-blade airscrew
2. Engine air intake
3. Cooling air intake
4. Oil cooler
5. Oil tank filler.
6. Oil pressure and scavenge pumps
7. Fuel pump
8. Fuel control unit
9. Igniter boost coil
10. Engine mounting foot
11. Forward fireproof bulkheads
12. Torch igniter
13. Auxiliary gear box drive
14. Polished turbine heat shroud
15. Fuel pipe and duct
16. Electric leads and duct
17. Engine mount attachments
18. Rear fireproof bulkhead



I Compressor bay | II Combustion chamber and turbine bay | III Jet pipe bay

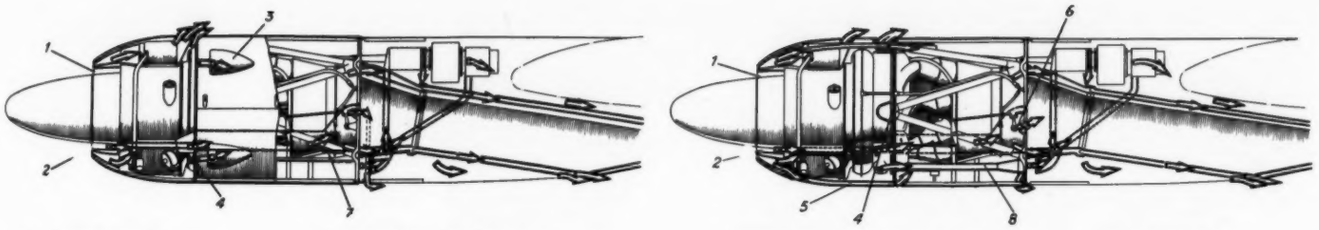
Marshal blowers that are normally working simultaneously. Since under many operating conditions the compressed air from the blowers is too warm, there is a cooler in the system, fed from an air scoop under the fuselage. Should the cooler be insufficient, a turbo-expander can be brought into the circuit to refrigerate the air further. The system is controlled thermostatically, and the steward can set it to operate on any one of three different temperature ranges (to suit passengers entering from sub-arctic to sub-tropic conditions) which are maintained to $\pm$ 7½ deg. C. Obviously, by changing the temperatures en route it is possible to acclimatize passengers on long flights from one latitude to another. Air to the cabin is delivered by ducts along the floor and through individual punkah-louvres for each passenger. Air to the toilets enters at the top of the compartment and is extracted through the floor, straight to the outlet valves. On the ground an electric fan draws air through the cooler intake and circulates it through the cabin floor trunks and to the punkah-louvres. Should there be a ground conditioning truck available, it can be connected to the cooler intake.

De-icing Equipment

The de-icing installation on the prototype was subject to intensive trials over the Atlantic off the West coast of Ireland this winter. These prototype trials were carried out with engines that had no intake heaters, but owing to their centrifugal compressors the "Darts" gave no trouble. Apart from the actual de-icing, the designer of the "Viscount" has ensured that his control surfaces remain effective and do not lose their "feel", even when there is a considerable load of ice on the aeroplane. The quantity of heat necessary for de-icing the wings and tail surfaces under the severest conditions is about 1,500,000 B. Th. U. per hour, which is supplied from the jet pipe gases, without recourse to troublesome and dangerous combustion heaters. Inboard engines alone are used, either of which can de-ice the whole aeroplane, since there is more room in these nacelles for the heat exchangers than in the slim outboard units. Gases are taken from the jet pipes into the heat exchangers, where they warm fresh air for the leading-edge ducts. Although tests in the laboratory have given no indication that there would be any corrosion or soot troubles with kerosene, it was decided to make sure by not taking the gases straight through the structure. The main plane double-skin de-icing duct (Fig. 3) shows how the hot air is passed through the one-eighth inch space between the skins for the first 15 percent of the chord. Exhaust to atmosphere is by surface louvres farther back on the top surface. The system stood up well in the trials : the machine flying pleasantly even when heavily iced; ice being easily removed at —28 deg. C.; and ice formation being prevented under all conditions while the heating was used. Windscreen de-icing is by fluid, while the airscrews will be electrically heated on production aeroplanes in place of the fluid used on the prototype.

Engine Installation

Since it is the most novel feature, the installation of the Rolls-Royce "Dart" power



1. Engine air intake
2. Annular cooling air intake
3. Air intake scoops (abolished)
4. Forward fireproof bulkhead (moved back).
5. Cowling hinge members acting as ducts
6. Louvres in cowling
7. Electric lead duct
8. Fuel pipe duct

Fig. 13 : Diagram showing the changes between the ventilation systems on the prototype (above) and production (below) engine installations. The outboard nacelle is shown, but essentially only the jet pipe arrangements are different.

plants is also the most interesting item on the "Viscount". Having to start with very little experience as a basis, the designer, in collaboration with the Rolls-Royce engineers, had to evolve the best compromise between power-plant, structural and aerodynamic efficiency.

Although intrinsically less subject to fire risk than a piston engine because of its fuel, the turbine engine presents certain difficulties of its own owing to the amount of heat in the neighbourhood of the combustion chamber and the turbine. It was this consideration, coupled with his lively appreciation of the importance of genuinely easy accessibility and removal, that led the designer to choose a completely isolated power plant rather than an aerodynamically cleaner nacelle built more into the wing. The power plant and nacelle are divided into three bays (Figs. 12 and 13) with two firewalls. In the first, the intake and compressor bay, are grouped all the accessories, the oil tank and the combustion equipment; while between the two firewalls, and in the plane of the combustion chambers and the turbine, control rods are of steel, unless, like the electrical leads and fuel pipes, they are enclosed in fire-proofed steel ducts. In this second bay, the hotter rear part of the combustion chambers and the turbine casing are enclosed in an internally polished stainless-steel shroud designed to reduce radiation. At the point of attachment of the tubular engine mounting to the airframe there is a second firewall that isolates the complete power unit, save for the jet pipe, from the airframe.

The small diamter of the turbine engine—38.5 in. over the close cowling—actually proves a problem when the designer tries to take full advantage of it. The diameter is not so very much more than the thickness of the wing, and it is therefore not easy to lay out a nacelle that will contain the jet pipe and undercarriage while retaining a good aerodynamic form. Furthermore, jet pipe noise is unendurable for long periods and the outlets must be arranged so that they are shielded from all the seats in the cabin. Fortunately, the residual thrust in the jet stream of the propeller turbine engine is a very small percentage of the total power, and losses due to deflecting the jet pipe are not serious. This being so, the solution on the "Viscount" is to run the jet pipes of the outboard engines straight aft and down 8¾ deg., while the inboard ones are deflected 20 deg. downward and 40 deg. outward in order to leave space in the nacelle for the undercarriage (Fig. 14).

Ventilation of the three bays, without undue cooling drag, required considerable thought. The two sketches in Fig. 13 show what was done on the prototype and how this layout was later modified to eliminate external scoops for the combustion chamber/turbine bay, all air coming in through the annular nose intake. The possibility of bad losses in a small intake slot round the spinner was found to be negligible because of the thinner blade roots possible with the smoother-running turbine engines; actual intake efficiency is 85 percent.

A shrouded jet pipe was chosen, in preference to a lagged one, largely because it could be supplied with cooling air from the combustion chamber/turbine bay. In this way, should there be a fire, flames will not sweep through outlet slots along the nacelle, but will travel down between the jet pipe and its steel shroud, making it hot, but suppressing direct contact of the flames on light alloy sheet structural parts. Outside the jet pipe shroud the rear nacelle is cooled by air spilling from the control and electrical lead ducts.

Fig. 15 shows something of the way in which engine maintenance has been considered. The main power plant side cowlings are hinged to the nacelle behind the main firewall and open outward until they are held to the wing by anchor struts. The smaller top and bottom panels fold upward and downward on the side ones. This design means that the weight is taken on the vertical hinges, so that the cowling can be

DIMENSIONS, WEIGHTS AND PERFORMANCE OF THE "VISCOUNT 701"

Version on Order for British European Airways Corp.
(Makers' Specifications)

DIMENSIONS	
Span	94 ft. 0 in.
Chord, root	14 ft. 10 in.
Length, overall	81 ft. 2 in.
Height, overall	26 ft. 9 in.
Track, oleo centres	23 ft. 10 in.
Wheel base	24 ft. 10.6 in.
AREAS	
Wing area, gross	963.0 sq. ft.
net	844.0 sq. ft.
Ailerons, total area aft of hinge	94.8 sq. ft.
Flap area, total	153.5 sq. ft.
Tail plane area, gross	238.0 sq. ft.
net	203.0 sq. ft.
Elevator areaaft of hinge	72.3 sq. ft.
Fin and rudder, gross area	124.0 sq. ft.
Rudder area aft of hinge	41.3 sq. ft.
Fuselage, total wetted area	2100.0 sq. ft.
WEIGHTS	
Max. take-off weight, normal	50,000 lb.
Max. increased take-off weight	51,000 lb.
Max. landing weight	47,500 lb.
Max. fuselage (disposable) load	12,400 lb.
Equipped weight	32,100 lb.
Structure weight, including undercarriage and flying controls	15,820 lb.
Power plants	7,050 lb.
Fuel and oil systems	950 lb.
Auxiliary services : hydraulic, pneumatic and electric	455 lb.
Safety devices : de-icing, dinghies, etc.	630 lb.
Equipment : lighting and cockpit furnishing, instruments, radio, radar	3,229 lb.
Furnishings	3,562 lb.
Removable equipment (water, de-icing fluid, life-belts, oxygen)	404 lb.
PERFORMANCE	
Cruising speed, 68 per cent power	315 m.p.h. at 20,000 ft.
85 per cent power	326 m.p.h. at 25,000 ft.
Service ceiling	30,000 ft.
on three engines	23,000 ft.
Take-off to clear 50 ft.	1,146 yds.
on three engines	1,375 yds.
Landing distance from 50 ft.	900 yds.
Climb, sea level	1,750 ft./min.
10,000 ft.	1,250 ft./min.
20,000 ft.	670 ft./min.
FUEL AND RANGES	
Normal fuel capacity; 8 interconnected outer plane cells, port and starboard	1,400 gals.
Long-range capacity : one tank in each inner plane	320 gals.
11,400 lb. payload, cruising 270 knots, ultimate range	720 sea miles
Allowance A	600 sea miles
Allowance B	400 sea miles
Allowance C	200 sea miles
2,700 lb. payload, cruising 270 knots, ultimaterange	1,980 sea miles
Allowance A	1,880 sea miles
Allowance B	1,680 sea miles
Allowance C	1,450 sea miles

A = take-off, climb to 25,000 ft. descent, landing
B = A, plus 200 sea miles to alternative airport.
C = A and B, plus 1 hr. stand-off at 175 knots at 5,000 ft. on two engines.

Fig. 15 : The new cowlings give exceptional accessibility and are easily handled by one man.

1. Engine changing hoist
2. Rolls-Royce slinging beam
3. Engine stand
4. Anchor struts
5. Check cable

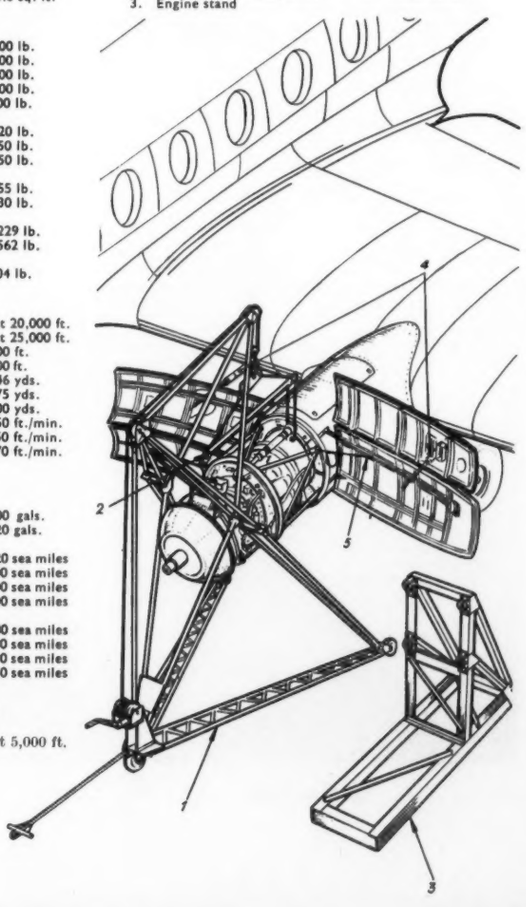


Fig. 14 : The outboard jet pipes are deflected downwards, whereas the inboard pipes are deflected downwards and outwards (photo taken at Paris-Orly Airport).

opened by one man, instead of two or three as is the case with some of the earlier heavy petal cowlings. Quick-release, positive-locking toggle fasteners are used, and there is a safety locking device. Small doors in the main cowling give access to individual components for minor servicing. The power plant is held by four bolts and can be removed, with or without the airscrew, in a *genuine* half-hour.

The fuel system is entirely housed in the wings and consists of nine bag-type crash-proof tanks in each wing. The tanks are readily removable though access panels in the lower wing surface, while the immersed fuel pumps are housed in isolating cells so that they can be removed without draining the fuel system. Provision is made both for normal and pressure refuelling. In order to overcome the severe power drop of the propeller turbine under high-altitude and tropical conditions, two water-methanol tanks are installed that give a supply sufficient for three minutes at full power. The supply rate is adjustable to give charge cooling to suit various ambient air temperatures.

Aeronautical Research in Britain

The work of the Aerodynamics Division, National Physical Laboratory

By V. S. Swaminathan, M. A., M. Sc., (Lond.), London

Two Lords Organize Research

Higher scientific and technical education and research in Britain owe much to two outstanding individuals. The late Lord Rayleigh, President of the Royal Society, interested his brother-in-law, A. J. Balfour, in the need for setting up a national institution for the determination of the many standards and constants required by modern industry. This need was met in 1900 by the establishment of the *National Physical Laboratory* (NPL), which will celebrate its Golden Jubilee "officially" next year to coincide with the Festival of Britain. Its object is threefold : to standardize and verify instruments, to test materials and to determine physical constants.

Few men of his time had so profound an influence on the development of university and higher technological education and research as Mr. (later Lord) Haldane. He was chairman of three University Commissions. The establishment of the *Imperial College of Science and Technology* (a British Charlottenburg) by the fusion of the Royal College of Science, the Royal School of Mines and the Central Technical College of the City and Guilds of London, and of the Aeronautical Research Committee (ARC) was alike due to his influence.

Without Viscount Haldane's abiding interest the *Department of Scientific and Industrial Research* (DSIR) would never have become a Department of State. It is this Department and not one of the Ministries which exercises supervision over NPL. This interest was shared and continued after the first World War by Lord Balfour, who put the new organization on a permanent and enlarged basis.

The beginnings of human flight led him to suggest in 1909 that the NPL should

The National Physical Laboratory at Teddington, Middlesex, from the air.

organize a special department for "continuous investigation, experimental and otherwise, of questions which must from time to time be solved in order to obtain adequate guidance in construction."

Britain took the first step towards a systematic study of aeronautical problems, upon which alone efficient aircraft can be built and operated, with the appointment of an *Advisory Committee for Aeronautics* by the Government in 1909. The late Lord Rayleigh was President of the Committee; Sir Richard Glazebrook, Director of the NPL, was its Executive Chairman. Its members included Sir Horace Darwin, F. W. Lanchester, Mr. Mallock, Col. O'Gorman, of the Royal Aircraft Factory, and Professor (later Sir Joseph) Petavel of Manchester University, who succeeded Sir Richard Glazebrook as Director of NPL. It owes much of its early success to the engineering genius of Lanchester.

Before long, the NPL set up an *Aerodynamics Division*. Lord Rayleigh laid the foundations on which the science of aeronautics has been built, and as a result there was rapid progress in design development despite the very primitive equipment, as it would now be thought, for model experiments which was available at Teddington. Following the first World War, a committee was set up under Glazebrook to advise on future arrangements for aeronautical research and education. This led to the creation of the *Aeronautical Research Committee* (ARC) with wider functions and extended powers under the Air Ministry. Sir Richard Glazebrook was again Chairman of this new Committee, which had as its members the Directors of Scientific Research at the Air Ministry, the Admiralty, the War Office and a representative of the DSIR.

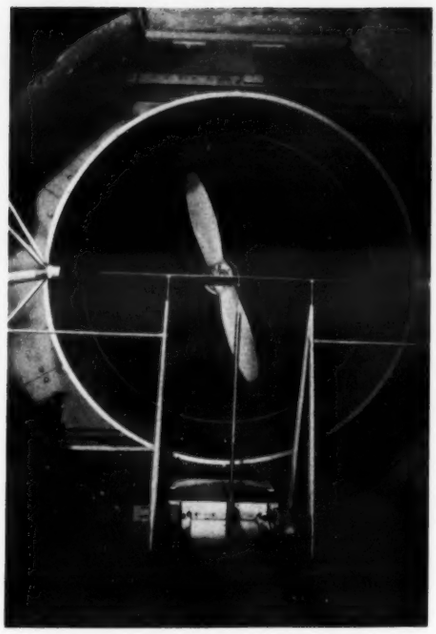
Sir Richard Glazebrook retired from the chairmanship of the Aeronautical Research Committee after 24 years, during which span aeronautics had grown from its childhood to an important industry. It was largely due to his vision, energy and ability that Britain had by then "an organization second to none in the strength of its links from the laboratory to the finished product". Men engaged on applied research and on experiments to promote reliability and efficiency were in close touch with the scientific members of the Committee, and designers of industry, with the Royal Aircraft Establishment (RAE, successor of the Royal Aircraft Factory) and directly with the Committee. Sir Richard was succeeded by Sir Henry Tizard as Chairman of the ARC.

*

The ARC sponsored several investigations of far-reaching importance. Developments in internal combustion turbines first claimed its attention, followed by work on dissipation of fog in 1920-21. On its advice H. E. Ricardo extended his researches on engines. In 1923-24 it recommended the use of aircraft to obtain daily records of atmospheric pressure, temperature, etc., at great heights in aid of meteorological forecasts. Later it encouraged supercharging of engines and the development of single sleeve—valve engines. The new compressed air tunnel at the RAE proved of value, as also the vertical wind tunnel for investigation of spinning. The ARC helped Professor R. V. Southwell in his work into a method of calculating stresses in frameworks which yielded important practical results. In 1933-34 the high-speed wind tunnel at the NPL Aerodynamics Division was completed, as well as a 24-ft. open-jet wind tunnel at the RAE. The researches of Ricardo into air-cooled sleeve-valve engines led to the successful manufacture of such types by the Bristol Aircraft Co. The great increase in speed and range of aircraft is due, in part, to application of smooth surfaces. The ARC took a practical interest in this problem, and also in devices for safe landing.

Work of the NPL Aerodynamics Division is done on the advice of the ARC. The Division is equipped with twelve large wind tunnels and whirling arms for experiments on aircraft models. In one tunnel the air circulates past the model at a pressure of 25 atmospheres and thereby eliminates scale effect. There are, too, high-speed tunnels capable of air speeds up to 600 m.p.h. Work on all types of machine and their component parts, as well as on aircraft carriers, airships, parachutes, etc., is in progress. Among results obtained are a theoretical and experimental investigation of flutter of aircraft members, which laid the foundations on which all flutter-preventive measures are based; study of fluid motion, which has greatly contributed to the determination of optimum shapes for aircraft bodies, wings, etc.; stability and control, including spinning, phenomena, are studied; by means of models of proposed aircraft designs performance estimates are checked adequately and unsatisfactory features remedied. The conception of the "Spitfire" fighter followed from work on seaplanes used in the Schneider Trophy Races.

The Compressed Air Tunnel. The operator manipulates the electric controls governing the position of the model and reads the measurements of the forces acting on the model's surfaces. Pressures up to 25 atmospheres are used in the tunnel, and the exhaust air is used to develop high-velocity air flow in other experimental tunnels.

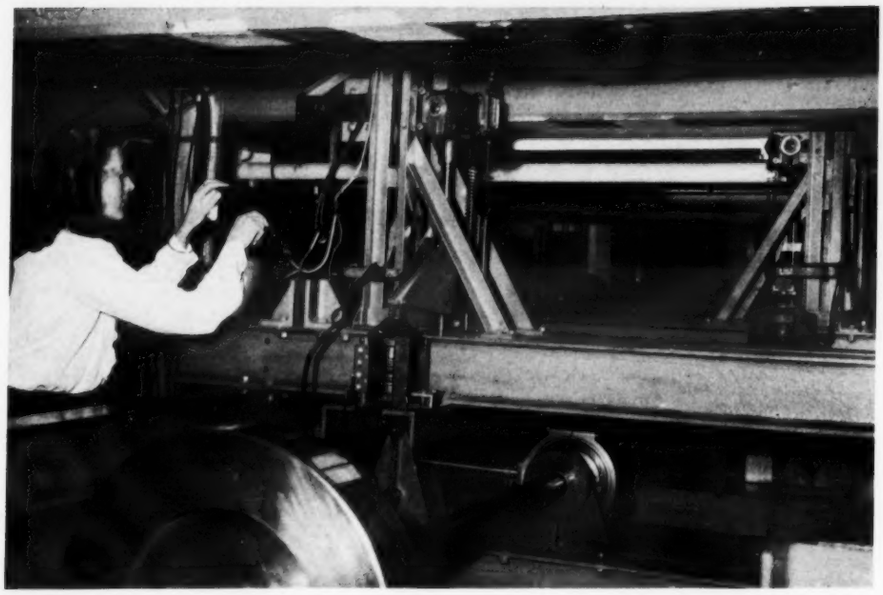


A view inside the compressed air tunnel looking past the model in position towards the airscrew which develops air speeds up to 60 m.p.h.

NPL's Present Rôle in Aeronautics

The Aerodynamics Division is presently busy on low speed research on the characteristics of a delta wing; experiments at subsonic and supersonic speeds at the 9 in. 3 in. high-speed wind tunnel; the growth of downwash behind a wing following a sudden gust, and boundary-layer suction tests for the removal of the effect of excrescences on the drag of an aerofoil. The Engineering Division is equipped with an 11 in. square supersonic wind tunnel to continue long-term work on compressible flow and high-speed flight.

The "*Delta*" (approximately triangular) plan form is one of the preferred shapes for



Experiment to determine the damping of an oscillating swept-back wing in an air stream. Apparatus beneath the tunnel is for forcing oscillations.

the wings of high-speed aircraft. In the Duplex wind tunnel an investigation is in progress to study the low-speed characteristics of such a wing, which is important for the take-off and approach stages of flight; the study also is a preliminary to the examination of the effects of compressibility on the flow over the wing. It is proposed to measure the forces and moments on the six-component balance and the distribution of pressure over the wing surfaces over a wide range of altitudes. In addition, the boundary layer and wake will be explored to assist in estimating the modifications of pressure distribution that can be ascribed to viscosity. This estimate should be possible by comparing the experimental pressures with those calculated by potential flow theory which neglects viscosity. It is hoped to provide data which will lead to a better understanding in detail of the conditions of flow over this type of wing, and will also check the validity of various approximate methods of calculating load distribution.

The best method of *designing controls to give desirable stability characteristics to modern tailless aircraft* has become important. For such an aircraft with swept-back wing the stability in pitch and roll is closely connected with the flow over the wing tips, and it is doubtful whether the standard control will prove generally satisfactory. To throw light on this problem wind tunnel tests are under way on a half wing with a cranked wing tip on which is fitted on alternative type of control, used many years ago by Professor Hill on early models of the Pterodactyl, which consists of a part of the wing tip rotating about an axis located at the quarter chord. Results of these tests will be compared with those obtained by a conventional control system. Work is also being extended to a straight tapered swept-back wing with two sizes of control. Here will be measured also the effects of an alteration of the axis of rotation, from an alignment orthogonal to the wind direction, to a position inclined backwards at about 45 degrees to the airstream.

The 9 in. x 3 in. *high-speed wind tunnel* is driven by injecting dry compressed air at roughly atmospheric temperature through an annular slot around the periphery of the tunnel downstream of the working section.

Experiment with a flexible model to find the wind speed at which the aileron control reverses. Setting the aileron for a run in the wind tunnel.

The width of this slot may be varied from 0.003 in. to 0.119 in. to suit working conditions; the maximum gauge pressure of the compressed air is 25 atmospheres. Pressure and temperature of the induced airstream entering the contraction preceding the working section are roughly atmospheric. This tunnel is a quarter-scale model of two 3 ft. x 1 ft. tunnels to be erected at the NPL in the near future. All three are intended for tests on bodies completely spanning the shorter side of the working section under conditions of two-dimensional flow. These tests will include further experiments on wing sections, including measurements on oscillating models and others fitted with control surfaces. Experiments done in the 9 in. x 3 in. tunnel have confirmed that the design of the larger full-scale types should be satisfactory, and they included observations on a series of round-nosed aerofoils at supersonic speeds.

In the design of large civil aircraft the effect of sharp gusts on wing stresses and passenger comfort is of great and growing importance. An attempt is being made to *trace the history of the downwash following a very rapid change of incidence* of a model wing in the wind tunnel. To obtain continuous records of the direction of the downwash two short platinum wires forming a small acute angle are placed in the downwash as nearly symmetrical to the flow as possible. These wires form the adjacent arms of a Wheatstone bridge and can be heated to about 200° C. by an alternating current. The other arms of the bridge are adjusted to give a convenient out-of-balance voltage when the wing is set at its initial inclination to the stream. A spring mechanism enables the wing to be rotated quickly through about 5°. During this process, and also for a longer period, as the direction of the downwash changes, the differential cooling effect experienced by the wires produces further changes of voltage across the bridge. After amplification these are applied to the plates of a cathode ray oscillograph, and when photographically recorded furnish details of the directional variation on a time base.

Wind tunnel tests of *laminar-flow wings and suction aerofoils* have shown that very low drag coefficients are obtainable with such designs, provided the flow in the boundary-layer remains laminar throughout the region of favourable pressure gradient. In flight, however, flow in the boundary layer may become turbulent because of dust or insects deposited on the nose of the wing in operating conditions. It is therefore essential to devise means of obviating the adverse effects of such deposits by removing the turbulent boundary layer as soon as possible after its formation. The tests in the tunnel pertain to a method in which the turbulent boundary layer is withdrawn

through a spanwise slot of 20 percent of the aerofoil chord back from the leading edge (beyond which dust or insects are unlikely to adhere), laminar flow being re-established down-stream of the slot. This method is equally applicable when the turbulence is due to imperfections of surface finish on the nose of the wing.

In the recently developed 11-in. wind tunnel in the *Engineering Division*, measurements are made of the behaviour of bodies in *supersonic airstreams*, and attention is being paid to problems arising from the application of tunnel measurements to free flight conditions, as well as to the development of experimental techniques, such as optical methods. Work has started on the complex subject of boundary layer-shock interaction, which is of particular importance in the behaviour of wing-body junctions, supersonic diffusers and flow duct entries. A preliminary investigation of the action of an inclined shock upon the tunnel wall boundary layer has yielded some interesting results indicating that the orthodox conceptions of boundary layer flow may not apply. This Division has long been interested in ejector action from the angle of wind tunnel operation at Mach numbers less than two,

9½-in. square supersonic wind tunnel with single-sided nozzle. Wind speed 1½ times the speed of sound.

and much pioneer work, performed before the late war, provided valuable data for induction wind tunnel design in the Laboratory.

Work of value to the aviation industry is also done in the Metallurgy and Radio Divisions of the NPL. Over a period of years the former has made an intensive study of aluminium and magnesium alloys. Their use for aircraft construction some thirty years ago is due largely to its work.

At the suggestion of the Directorate of Scientific Research at the Air Ministry the *Radio Division* inaugurated a series of experiments, the results of which bore fruit at the time of the critical Battle of Britain. It did extensive research for the Radio Board on wave propagation and the origin of atmospherics. Coupled with its work on direction finding, these have had a marked effect on radio communication and on the provision of improved aids to marine and aerial navigation.

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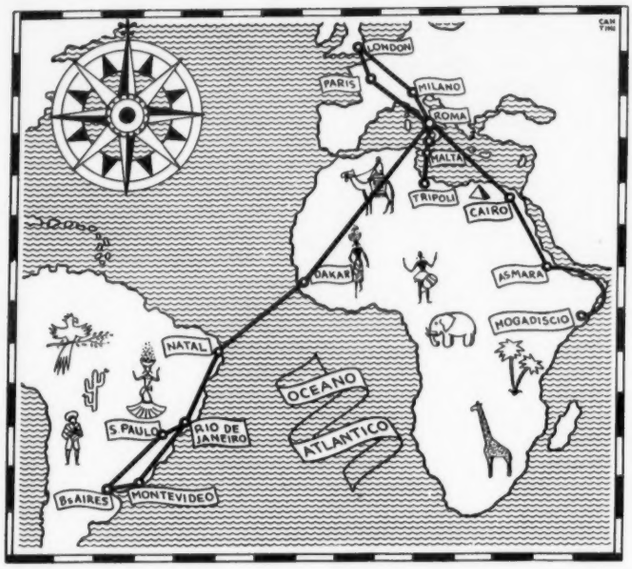

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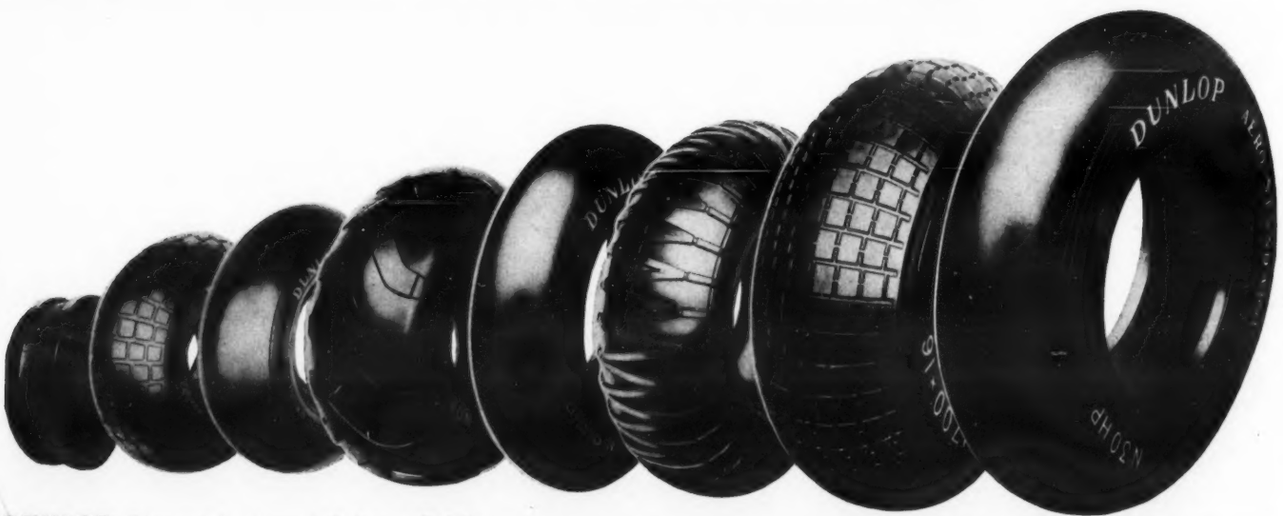

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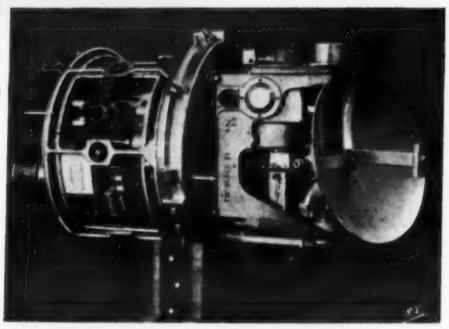

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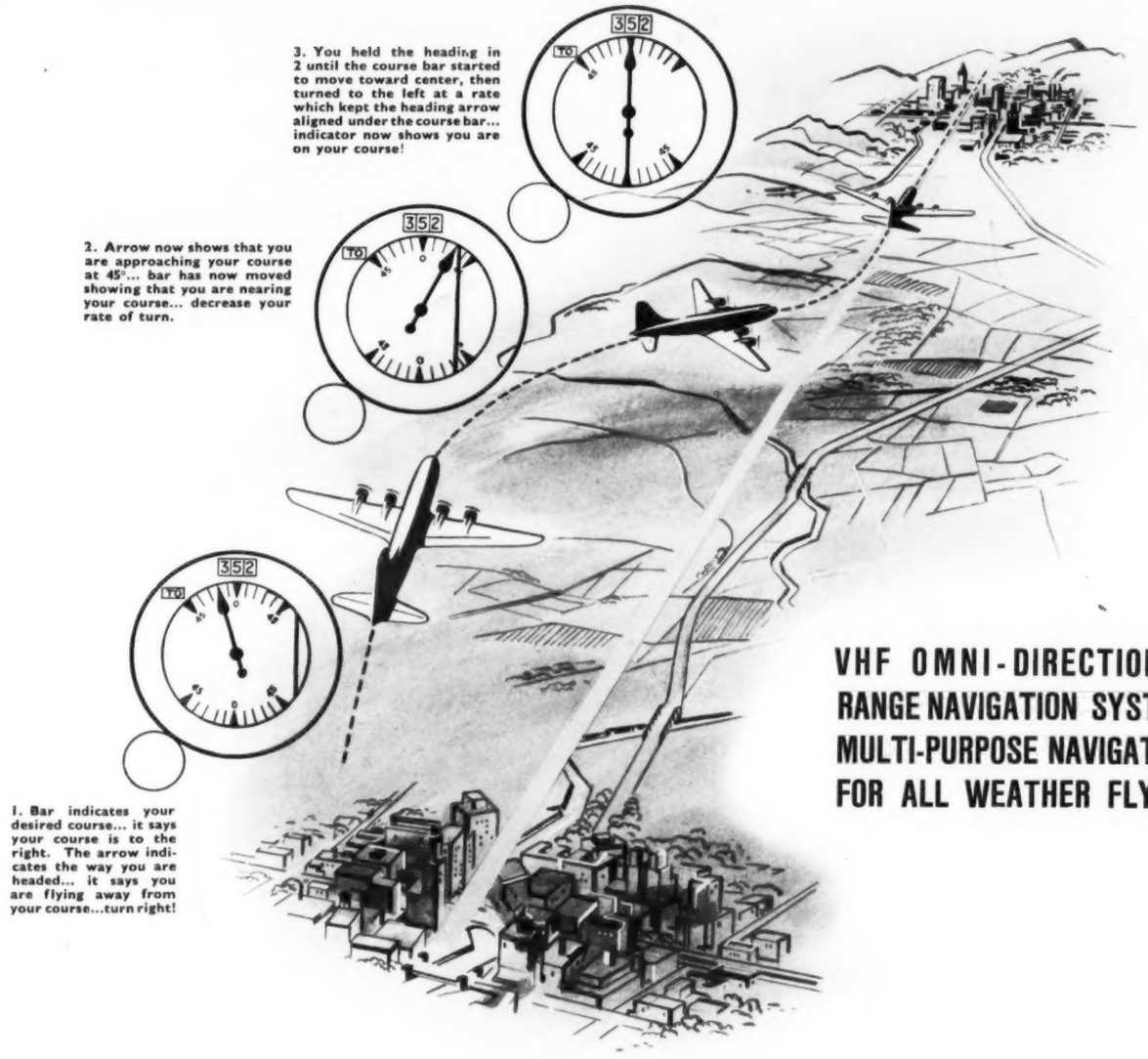
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